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HAMILTON'S ESSENTIALS

OF ARITHMETIC

FIRST BOOK

BY

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AMERICAN BOOK COMPANY

NEW YORK   CINCINNATI   CHICAGO
     BOSTON   ATLANTA
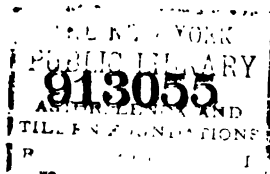
PREFACE

THE "Essentials of Arithmetic" consists of two books, which cover the arithmetical work from the second to the eighth year.

The two important ends sought in the teaching of arithmetic are (1) to give the pupil such a mastery of number combinations and processes as will enable him to perform with accuracy and speed all common numerical operations; and (2) to train him in the skillful application of these processes to the problems that he is likely to meet in his daily experiences. This series has aimed to lay equal stress on both these important phases of arithmetic.

The frequent drills in numbers in their abstract relations develop habits of accuracy and speed. The motivation of the drill work, especially in the earlier grades, is secured by means of interesting number games.

The problems have been framed with a view to the pupil's interests. At first they deal entirely with his life at home, at school, on the street, and in the playground; but gradually they reach out to include his contact with the larger spheres of social and industrial life. The problems are of two types, —first the isolated problems, which provide direct application of a principle to some need or experience of the pupil; and, second, groups of related problems, called "Everyday Use of Numbers," which center about an idea or a situation in which the pupil feels a vital interest. These related problems serve as a review of various principles previously taught. The problems are all *real* because they are true to life. They carefully avoid impractical conditions and all questions that have no relation to common experience.

The pupil's self-activity is utilized in constructive work and in the framing of original problems. His initiative is exercised by leading him to discover many arithmetical truths for himself. The importance of the correct interpretation of problems and of the choice of the best methods for their solution is emphasized.

———

The "**First Book**" covers the work that is usually taught in the second, third, fourth, and fifth years, each chapter representing one half year's work. The second year's work, contained in Chapters I and II, may be used as review for classes that begin the use of a text-book in the third year. Chapters III and IV comprise the third year's work, Chapters V and VI, the fourth year's work, and Chapters VII and VIII, the fifth year's work.

The effort to follow prevailing prices has been limited by their rapid fluctuations and by their variation in different parts of the country. Teachers should encourage pupils occasionally to substitute current local prices, thereby varying the problems in the book.

SAMUEL HAMILTON

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CHAPTER I

IN THE FARMYARD

one
1

two
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three
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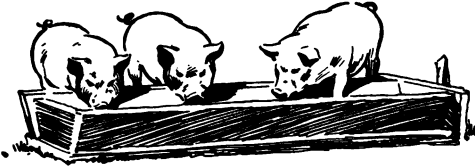
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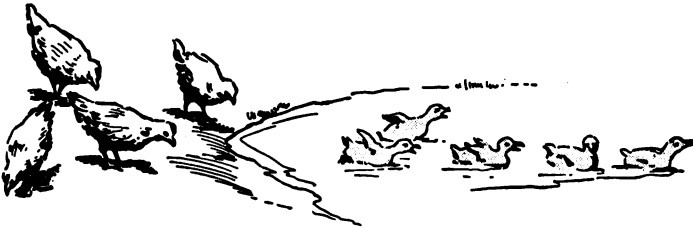
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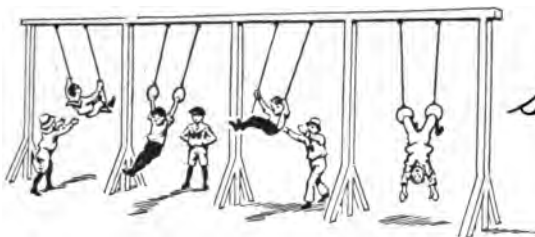
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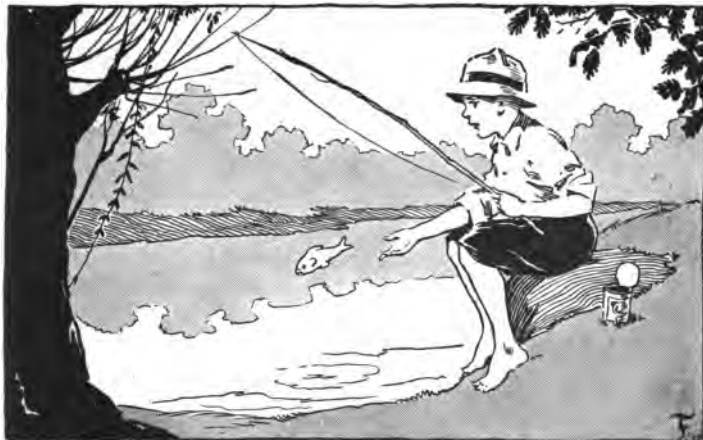
1. Read this Mother Goose rime:

One, two, three, four, five;   1, 2, 3, 4, 5;
I caught a fish alive.   I caught a fish alive.
Six, seven, eight, nine, ten;   6, 7, 8, 9, 10;
I put it back again.   I put it back again.

Numbers tell *how many*. You can write numbers either in words or in figures.

one	two	three	four	five	six	seven	eight	nine	ten
1	2	3	4	5	6	7	8	9	10
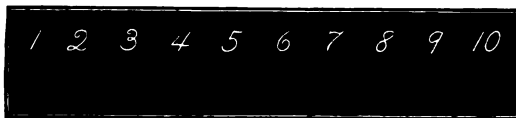
2. Read the numbers on this blackboard.

3. Write in figures: one, two, three, four, five, six, seven, eight, nine, ten.

$$1 + 1 = 2$$
$$2 + 1 = 3$$
$$1 + 2 = 3$$
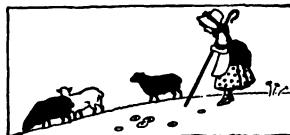
and are 2 sheep.

and are 3 sheep.

and are 3 sheep.

1. Little Bo Peep has 2 black sheep and 1 white sheep. How many sheep has she?

2. Draw 1 sheep and 1 sheep. How many sheep have you drawn?

3. How many lambs are 1 lamb and 2 lambs?
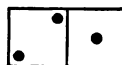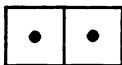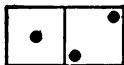
4. How many are 1 and 2? 1 and 1? 2 and 1?

The sign + means *and* or *plus*.
The sign = means *equal* or *equals*.

$$2 + 1 = 3.$$
2 *plus* 1 *equals* 3.

5. Read: $1 + 1 = 2$ $2 + 1 = 3$ $1 + 2 = 3$

6. Little Bo Peep saw 2 sheep in the meadow and 1 sheep in the lane. How many sheep did she see in all?

7. Tell a number story about 1 girl and 2 girls.

$$2 - 1 = 1$$
$$3 - 2 = 1$$
$$3 - 1 = 2$$

1. Jack Horner has 3 plums. He eats 1 plum. How many plums has he left?

⊘ ⊘ ⌀   3 plums less 1 plum = 2 plums.

2. Jack takes 2 plums from 3 plums. How many plums are left?

⊘ ⌀ ⌀   3 plums less 2 plums = 1 plum.

3. Jack has 2 plums. He gives 1 plum to his sister. How many plums has he left?

⊘ ⌀   2 plums less 1 plum = 1 plum.

The sign − means *less* or *minus*.

$$3 - 2 = 1.$$

3 *less* 2 *equals* 1, or 3 *minus* 2 *equals* 1.

4. Read: $3 - 1 = 2$ $2 - 1 = 1$ $3 - 2 = 1$

5. 2 thumbs less 1 thumb are how many thumbs?

6. Tell a number story about 2 pies less 1 pie.

7. Tell a number story about 3 boys less 2 boys.

8. Give the answers:

$3 - ? = 2$	$1 + ? = 3$	$2 - 1 = ?$
$? - 2 = 1$	$1 + 1 = ?$	$? + 1 = 3$

$3+1=4$	$4-3=1$	$4+1=5$	$5-4=1$
$2+2=4$	$4-2=2$	$3+2=5$	$5-3=2$
	$4-1=3$		$5-2=3$
			$5-1=4$

1. Mary picked 1 poppy. Then she picked 3 more poppies. How many poppies did she have then?

2. Mary counted 4 daisies in her garden. She picked 1 daisy. How many daisies were left in the garden?

3. There were 2 girls playing in the garden; 3 more girls came to play with them. How many girls were then playing?

4. Draw 4 violets. Rub out 2 violets. How many violets are left?

5. Write two groups of 2 numbers whose sum is 5.

6. From a bush containing 5 roses, 3 roses were picked. How many roses were left on the bush?

7. Jack had 5 tulips. He gave 2 tulips to Jill. How many tulips had he then?

8. Tell a number story about 2 lilies and 2 lilies.

9. Tell a number story about 3 pansies and 2 pansies.

10. $2+2=?$ $4+1=?$ $3+1=?$ $2+1=?$

11. $1+3=?$ $1+4=?$ $2+3=?$ $3+2=?$

12. $4-1=?$ $4-2=?$ $4-3=?$ $3-2=?$

13. $5-4=?$ $5-3=?$ $5-1=?$ $5-2=?$

1 inch ____

2 inches _____

3 inches _____

1. How long is the first line? the second line? the third line?

2. How long are the first and second lines together? the first and third lines? the second and third lines?

3. Draw lines 1 inch long, 2 inches long, 3 inches long, 4 inches long, and 5 inches long. Make problems about adding them.

4. Tell number stories, using the following numbers:

$2+2$	$5-2$	$1+3$	$5-4$	$2+1$	$3-3$
$4+1$	$4-3$	$2+3$	$4-4$	$5-3$	$4-2$

Numbers to be added are also written like this: $\begin{array}{r} 3 \\ 2 \\ \hline 5 \end{array}$

5 is called the **sum** of 2 and 3.

5. Give the sums:

4	3	1	2	3	1	1	2	2	1
1	2	1	1	1	2	3	3	2	4

6. Supply the missing numbers:

$3+?=4$	$2+?=5$	$2+?=4$	$3+?=5$
$4-3=?$	$5-2=?$	$4-2=?$	$5-3=?$

7. What number must be added to the lower number to make the upper number?

4	5	3	2	1	5	4	3	5
3	3	2	1	1	2	2	1	4

$5+1=6$	$6-5=1$	$6+1=7$	$7-5=2$
$4+2=6$	$6-4=2$	$5+2=7$	$7-4=3$
$3+3=6$	$6-3=3$	$4+3=7$	$7-3=4$

The first domino shows that $5+1=6$, that $6-5=1$, and that $6-1=5$.

1. Tell what each of the other dominoes shows.

The figure **0** is called **zero**. It means **not any**.

$0+6=6$ $6+0=6$ $6-0=6$ $0+7=7$ $7+0=7$ $7-0=7$

2. Add:

2	5	1	4	3	6	7	0	4	6
4	2	5	3	3	1	0	6	2	0

Instead of saying "take 2 from 4" you may say "**subtract** 2 from 4."

When you find what number must be added to a number to make a given number, you subtract.

3. Subtract:

6	7	6	7	6	7	6	7	7	6
2	4	3	0	5	5	4	2	3	0

4. Edith invited 4 boys and 2 girls to her party. How many children did she invite?

5. How many days are left in a week when 4 days have passed?

One half $\frac{1}{2}$

1. There were 6 little mice in a barn. The cat frightened 3 of them away. How many mice remained in the barn?

2. How many mice are one half of 6 mice?

3. What part of the mice stayed in the barn?

4. How many cats are one half of 4 cats?

5. Place 6 pencils in 2 equal groups. What part of the pencils is in the first group? in the second group? We write *one half of six is three* in this way:

$$\frac{1}{2} \text{ of 6 is 3.} \qquad \overset{\bullet\bullet\bullet}{\tfrac{1}{2}\text{ of 6}} \ \bigg|\ \overset{\bullet\bullet\bullet}{\tfrac{1}{2}\text{ of 6}}$$

6. Find $\frac{1}{2}$ of 2 mice.

7. Draw a line 4 inches long. How many inches long is $\frac{1}{2}$ of it?

8. I had 4 cents and paid 2 cents for a chocolate mouse. What part of my money did I spend?

9. Make a drawing to show that $\frac{1}{2}$ of 6 inches is 3 inches.

10. $\frac{1}{2}$ of 4 = ? $\qquad \frac{1}{2}$ of 2 = ? $\qquad \frac{1}{2}$ of 6 = ?

$7+1=8$	$8-7=1$	$8+1=9$	$9-8=1$
$6+2=8$	$8-6=2$	$7+2=9$	$9-7=2$
$5+3=8$	$8-5=3$	$6+3=9$	$9-6=3$
$4+4=8$	$8-4=4$	$5+4=9$	$9-5=4$

1. Draw dominoes to show all the groups of two numbers whose sum is 8; and all whose sum is 9. Then tell, as on p. 16, what else each domino shows.

2. Add:

4	6	5	8	7	6	4	7	8	9
4	3	3	1	2	2	5	1	0	0

3. Subtract:

8	9	9	8	8	9	8	9	9	8
5	6	7	7	6	4	4	5	1	3

• • • • | • • • •
$\frac{1}{2}$ of 8 $\frac{1}{2}$ of 8 $\frac{1}{2}$ of $8 = ?$

4. What number must be added to the lower number to make the upper number?

9	8	8	8	9	9	9	8	9	8
5	5	6	4	7	3	4	2	6	3

5. Find the answers:

$4+4=?$	$8-6=?$	$8-4=?$	$8+0=?$
$8-5=?$	$\frac{1}{2}$ of $8=?$	$3+5=?$	$8-7=?$
$5+3=?$	$6+2=?$	$8-2=?$	$7+1=?$

6. There were 9 frogs in a pond; 3 hopped out. How many frogs were left in the pond?

7. 8 boys were playing leap frog; 4 boys went home. How many boys were left?
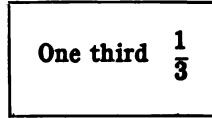
One third $\frac{1}{3}$

1. Place 6 cents in 3 equal groups. We call each group one third of 6 cents.

2. What part of 6 cents is in the first group?

3. What part of 6 cents is in the second group? in the third group?

4. How many cents are one third of 6 cents?

5. One third of 6 daisies is how many daisies?

6. One third of 6 pencils is how many pencils?

We write *one third of six is two* in this way:

$\frac{1}{3}$ of 6 is 2. $\frac{1}{3}$ of 6 | $\frac{1}{3}$ of 6 | $\frac{1}{3}$ of 6

7. Draw 9 balls and divide them into 3 equal groups.

OOO OOO OOO

8. What name is given to each part?

9. Draw a line 9 inches long and divide it into 3 equal parts.

10. How many kittens are $\frac{1}{3}$ of 6 kittens?

11. Ada knitted 9 sweaters. Clara knitted $\frac{1}{3}$ as many. How many sweaters did Clara knit?

12. If $\frac{1}{3}$ of 6 eggs were broken, how many eggs were broken?

13. $\frac{1}{3}$ of 6 = ? $\frac{1}{3}$ of 9 = ? $\frac{1}{3}$ of 3 = ?

9 + 1 = 10	10 − 9 = 1	10 − 4 = 6
8 + 2 = 10	10 − 8 = 2	10 − 3 = 7
7 + 3 = 10	10 − 7 = 3	10 − 2 = 8
6 + 4 = 10	10 − 6 = 4	10 − 1 = 9
5 + 5 = 10	10 − 5 = 5	

• • • • • | • • • • •

$\frac{1}{2}$ of 10 $\frac{1}{2}$ of 10
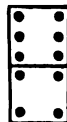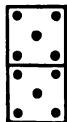
1. Draw dominoes to show all the groups of two numbers whose sum is 10. Then tell, as on p. 16, what else each domino shows.

2. From 10 take 8; take 9; 5; 4; 3; 2; 6; 7; 1.

3. Add:

8	4	3	6	9	5	7	1	2
2	6	7	4	1	5	3	9	8

4. 10 children marched out of the shoe in 2 equal rows. How many children were there in each row?

5. One half of 10 children is ⎯ children.

6. The children had 3 blue balls and 7 red balls. How many balls did they have in all?

7. If 6 of the 10 children were boys, how many were girls?

8. Tell number stories about children, using the numbers in the oblong at the top of the page.

1. $5 + ? = 9$ $10 - 6 = ?$ $10 - 8 = ?$

2. $10 - 5 = ?$ $? + 7 = 10$ $2 + 8 = ?$

3. $6 + 4 = ?$ $\frac{1}{2}$ of $10 = ?$ $7 + ? = 10$

4. Take the number in the center from each number outside of the circle.
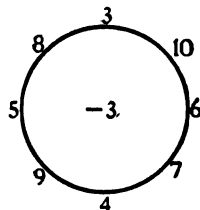
5. **Number Game.**

The child in the center announces the number that is to be the sum; for example, 9. She then gives one of two numbers whose sum is nine. The children in the ring give, in turn, the number that must be added to the given number to make nine.

Thus, if the child in the center says 4, one child in the ring says 5, etc. When a child fails, he takes his place in the center and at the same time the child in the center joins the ring.

6. Add:

7	4	6	5	4	3	5	8	9	6	10
3	3	4	3	5	7	5	2	1	3	0

1. Add quickly:

1	2		2	3		3	4		
1	1		2	1		2	1		
3	4	5	4	5	6	4	5	6	7
3	2	1	3	2	1	4	3	2	1
5	6	7	8		5	6	7	8	9
4	3	2	1		5	4	3	2	1

2. Add:

8	6	6	5	5	4	5	3	4	5
2	3	4	2	3	3	4	3	4	5

3. Subtract:

9	7	8	7	8	6	8	9	7	5
4	3	5	4	2	3	4	5	2	3

4. Add:

4	3	3	2	6	7	0	4	2	7
6	7	4	8	0	2	5	5	0	3

What number must be added to the lower number to make the upper number?

5.

8	7	5	6	4	4	5	2	9
1	6	0	4	2	0	5	0	7

6.

8	7	6	4	5	9	8	6	8
6	5	2	3	2	6	3	4	5

Drill
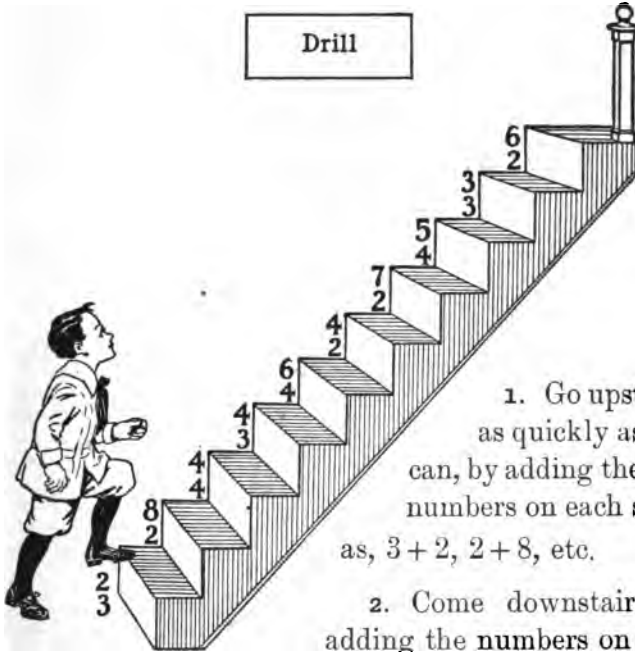
1. Go upstairs, as quickly as you can, by adding the two numbers on each step; as, $3 + 2$, $2 + 8$, etc.

2. Come downstairs by adding the numbers on each step from top to bottom; as, $6 + 2$, $3 + 3$, etc.

3. Run along this pavement by subtracting the lower number from the upper number on each flagstone; as, $7 - 3$, $8 - 6$, $9 - 7$, etc.

1. Read the following numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

2. Tie ten sticks in a bundle, as shown in the picture. 10 ones = 1 ten.

3. Add 1 stick to the bundle.

4. Add 2 sticks to the bundle.

eleven
11

twelve
12

thirteen *fourteen* *twenty*
13   14   20

5. How many are 10 + 3? 13 means 1 ten and 3 ones.

6. How many are 10 + 4? 14 means 1 ten and 4 ones.

7. What does 20 mean? 17? 12? 15? 16? 18? 19?

8. Write the numbers from eleven to twenty.

9. Read: 11, 12, 13, 14, 15, 16, 17, 18, 19, 20.

10. Copy:

fifteen *sixteen* *nineteen*
15   16   19

seventeen *eighteen*
17   18

In the Toy Store

Paper doll,	1 cent	Ball,	5 cents
Top,	2 cents	Boat,	6 cents
Whistle,	3 cents	Dominoes,	7 cents
Horn,	4 cents	Puzzle,	8 cents
Bean bag,	5 cents	Dishes,	9 cents

Find how much each child pays in the toy store

1. Alice buys a paper doll and dishes.
2. Robert buys a boat and a horn.
3. Mary buys dominoes and a top.
4. John buys a boat and a whistle.
5. Cora buys dominoes and a whistle.
6. Frank buys a puzzle and a top.
7. Ella buys a bean bag and a horn.
8. James buys a boat and a top.
9. Maud buys two horns.
10. Arthur buys two balls.
11. How much more does a puzzle cost than a horn?
12. What is the difference in price between dominoes and a whistle?
13. How much more must be paid for a set of dishes than for a bean bag?
14. How much more do dominoes cost than a ball?
15. How much more does a set of dishes cost than a boat?
16. Ask questions about any two toys you may choose.

Try to find as many *right answers* as possible in 1 minute:

Add:

	a	b	c	d	e	f	g	h	i	j
1.	2	2	1	4	3	3	3	4	5	4
	1	2	1	1	2	1	3	3	1	2
2.	6	5	7	8	9	8	7	6	4	5
	1	2	1	1	1	2	2	2	4	3
3.	5	5	5	6	7	8	9	6	7	6
	4	0	5	0	3	0	0	4	0	3

Subtract:

	a	b	c	d	e	f	g	h	i	j
4.	9	8	6	5	7	4	3	2	5	7
	5	6	4	3	5	3	2	2	5	4
5.	7	8	9	5	6	7	8	9	4	9
	6	7	4	2	3	3	5	3	2	8
6.	8	9	7	6	5	4	9	8	7	8
	4	6	7	2	4	4	7	8	2	3

What number must be added to the lower number to make the upper number?

	a	b	c	d	e	f	g	h	i	j
7.	8	9	7	5	9	8	6	1	4	3
	2	6	4	2	0	5	5	1	1	0

CHAPTER II

Read : These children went nutting. The first found 37 nuts, the second, 59 nuts, the third, 60 nuts, and the fourth, 75 nuts.

The figure **0** is called **zero**. It means **not any**. When placed to the right of 1, as in 10, the figures stand for *ten;* 20 represents *twenty;* 30, *thirty;* 40, *forty;* 50, *fifty;* 60, *sixty;* 70, *seventy;* 80, *eighty ;* 90, *ninety.*

The right-hand figure in a number is called **ones'** figure; the second figure is called **tens'** figure. Thus, 14 is 1 *ten* and 4 *ones ;* 21 represents *twenty-one.*

1. Read: 14, 25, 48, 59, 64, 70, 91, 40.

2. Read the numbers in each column, beginning at the top; at the bottom.

3. Read the numbers in each row, beginning at the left.

4. Write the numbers having 7 in tens' place; 6 ; 0 ; 1 ; 5 ; 2 ; 3 ; 9 ; 8 ; 4.

0	10	20	30	40	50	60	70	80	90
1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99

2, 4, 6, 8, 10, etc.
5, 10, 15, 20, 25, etc.
10, 20, 30, 40, 50, etc.

Ada
John
Frank
Eva

1. In this score card, how many spaces are there for Ada's record? Count them.

2. How many spaces are there for Ada and John together? Count them by twos.

3. How many spaces are there for Frank and Eva together? for all four children? Count them by twos.

4. Count the dots on the dominoes by fives; by tens.

5. A dime is worth ten cents. Count by tens the number of cents which these dimes are worth.

6. How many cents do twenty nickels equal?

$9+2=11$	$11-9=2$	$9+3=12$	$12-9=3$
$8+3=11$	$11-8=3$	$8+4=12$	$12-8=4$
$7+4=11$	$11-7=4$	$7+5=12$	$12-7=5$
$6+5=11$	$11-6=5$	$6+6=12$	$12-6=6$

1. Draw dominoes to show all the combinations of two numbers that make 11 and 12. Tell, as on p. 16, what else each domino shows.

Add:

2.
$$
\begin{array}{ccccccccccc}
2 & 8 & 9 & 7 & 8 & 7 & 6 & 6 & 10 & 10 \\
9 & 3 & 3 & 4 & 4 & 5 & 5 & 6 & 2 & 1
\end{array}
$$

Subtract:

3.
$$
\begin{array}{ccccccccccc}
11 & 12 & 11 & 12 & 12 & 11 & 12 & 11 & 11 & 12 \\
9 & 8 & 7 & 9 & 7 & 8 & 6 & 6 & 5 & 5
\end{array}
$$

● ● ● ● ● ● | ● ● ● ● ●   ● ● ● ● | ● ● ● ● | ● ● ● ●

4. $\frac{1}{2}$ of 12 = ? $\frac{1}{3}$ of 12 = ?

5. Edith played 3 games of croquet on Monday and 8 games on Tuesday. How many games did she play both days?

12 things are called a dozen

6. Our class knitted a dozen sweaters one week and 3 less the second week. How many did we knit the second week?

7. Frank sold a dozen thrift stamps to Clara and David. Clara bought $\frac{1}{2}$ of them. How many did David buy?

Blind Man's Number Board

NOTE. Players close their eyes and point three times. Touching a line counts 0.

1. Ella's record is 2, 0, 3.   Find her score.

2. Find John's score. His record is 5, 1, 2.

3. What   is   Ada's score?   Her record is 3, 5, 2.

4. Paul's record is 3, 5, 4.   Find his score.

5. What is Maud's score?   Her record is 4, 1, 2.

6. Who has won?   7. Who has the lowest score?
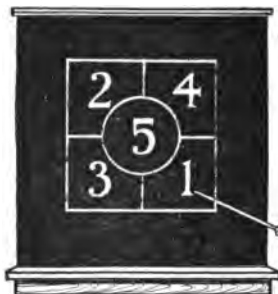
Pitching Circles

NOTE.   This game is to be played on the playground or at home.   Keep a score.   Each player pitches three circles. A circle touching any line counts 0.
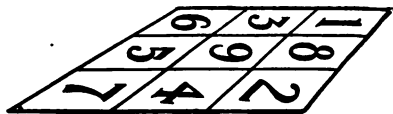
1. Walter's record is 8, 0, 4.   Find his score.

2. Ruth's record is 0, 9, 3.   Find her score.

3. Robert's record is 6, 4, 1.   Find his score.

4. Mary's record is 3, 8, 1.   Find her score.

Examine a foot rule. Observe that it is divided into twelve equal spaces. Each space is called one inch.
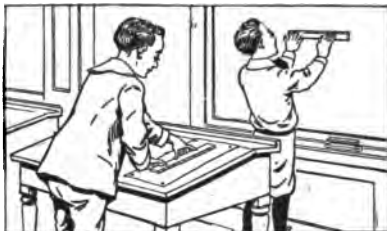
A foot rule is 12 inches long.

1. Cut from cardboard a foot rule and mark the inches on it.

The following is a picture of a foot rule, although it is *only one fourth the real length.*

2. Count the number of spaces that represent inches.

3. With your rule, draw a line 1 inch long; 4 inches long.

4. John is 3 feet and 6 inches tall. Measure on the wall and show his height.

5. Mark off with the rule on the blackboard a line 1 foot in length; 2 feet in length.

6. Without using the rule, draw a line 1 foot long. Measure it and see whether it is correct.

7. Estimate the length of your desk. Measure it and see whether you are correct.

8. Estimate and then measure the length of other objects.

$$3 \text{ feet} = 1 \text{ yard}$$

1. Measure a yardstick with your foot rule.

2. One yard is equal to how many feet?

3. Name five things that are sold by the yard.

4. Tell how the storekeeper measures a yard of calico or a yard of ribbon or of lace.

5. Measure with a yardstick and draw a line on the blackboard 1 yard in length; 2 feet in length; 1 foot in length.

6. Measure with a yardstick the length of the classroom. Tell its length in yards and feet.

7. How wide do you think the classroom is? Measure the width and tell whether your answer is correct.

8. Measure the width of the windows; the height of a pupil's desk; the height of the teacher's desk; the width of a door; the distance of a blackboard from the floor.

9. Find the height in feet and inches of the tallest boy in the class.

10. Draw three lines on the blackboard, without measuring them, — the first 1 inch long, the second 1 foot long, and the third, 1 yard long. Test these lines with a yardstick.

1.

$1 + 1 = 2$	$2 + 2 = 4$	$3 + 3 = 6$	$4 + 4 = 8$
2 times $1 = 2$	2 times $2 = 4$	2 times $3 = 6$	2 times $4 = 8$

The sign × means *times*.

2. Count by 2's to 12.

3. Build the table of 2's as shown at the right.

4. Add the columns and then read them thus:

```
                2
              2 2
            2 2 2
          2 2 2 2
        2 2 2 2 2
      2 2 2 2 2 2
```

"One 2 is 2"; "two 2's are 4"; "three 2's are 6"; and so on.

5. Memorize this table:

$2 \times 1 = 2$	$2 \times 4 = 8$	$1 \times 2 = 2$	$4 \times 2 = 8$
$2 \times 2 = 4$	$2 \times 5 = 10$	$2 \times 2 = 4$	$5 \times 2 = 10$
$2 \times 3 = 6$	$2 \times 6 = 12$	$3 \times 2 = 6$	$6 \times 2 = 12$

6. At 2 cents each, find the cost of 2 pencils; 4 pencils; 3 pencils; 6 pencils; 5 pencils.

7. 2×3 splints = — splints. 3×2 splints = — splints.

Notice that $2 \times 3 = 3 \times 2$.

8. 2×4 pins $= 4 \times$ — pins.

9. 2×5 eggs = — eggs. 5×2 eggs = — eggs.

10. 2×6 cents = — cents. 6×2 cents = — cents.

11. $2 \times 5 = ?$ $2 \times 3 = ?$ $2 \times 4 = ?$ $2 \times 6 = ?$ $6 \times 2 = ?$

HAM. ESS. AR. I — 3

1. What is the cost of three 2-cent stamps? of two 3-cent stamps?

2. Ada bought 2 spools of thread for 5 cents each. How much did both spools cost?

3. Paul's father had 6 cows in each of 2 fields. How many cows did he have?

4. Martha knitted 2 pairs of socks for each of 4 friends. How many pairs of socks did she knit?

5. Anna had 12 towels to iron. When she had ironed $\frac{1}{2}$ of them, how many had she ironed?

6. Mother made 2 cakes of potato flour. She used 4 eggs for each. How many eggs did she use for both cakes?

7. If she had 12 eggs at first, how many were left?

8. Paul sold 2 thrift stamps to each of 2 friends. How many stamps did he sell?

9. Arthur found 12 eggs in the barn. 7 of the eggs were brown and the others were white. How many white eggs did he find?

10. A hat cost 4 dollars. How much did 2 hats of the same kind cost?

11. How many eggs are $\frac{1}{2}$ dozen eggs?

12. Tell number stories about:

2 × 6 cents	2 × 4 errands	$\frac{1}{2}$ of 12 pins
2 × 2 games	2 × 5 ships	4 × 2 frogs

1. Draw dominoes to show all the groups of two numbers, each below 10, whose sum is 13; 14; 15; 16; 17; 18.

2. Tell, as on p. 16, what else each domino shows.

Add:

a	b	c	d	e	f	g	h	i	j	k	l
3. 9	9	7	9	9	8	8	8	7	8	9	9
4	5	7	6	7	7	8	6	6	5	8	9

Subtract:

a	b	c	d	e	f	g	h	i	j
4. 13	14	15	16	17	18	13	15	16	17
7	8	9	7	8	9	9	6	8	9
5. 16	14	13	13	14	15	15	14	14	13
9	9	6	5	7	8	7	6	5	8

Make problems about each of these numbers: 13, 14, 15, 16, 17, 18. Thus, "Our flag has 7 red stripes and 6 white stripes. How many stripes are there in all?"

Copy and add:

6. 5	2	4	3	2	4	3	4	6	6
3	3	6	5	4	5	6	5	7	5
2	4	0	3	3	3	6	4	2	4
3	5	5	6	7	5	3	5	3	3

7. 2	3	4	5	6	7	8	9	6	3
4	5	2	2	0	1	0	0	3	5
0	1	0	3	2	3	0	2	0	6
9	8	8	8	5	4	5	6	4	4

1. A chain is as strong as its weakest link. Test the strength of this chain by adding quickly the two numbers in each link.

Repeat the sums that give you trouble until you know them.

2. From **6** take 5, 4, 2, 3.   From **7** take 5, 6, 4, 2, 3.

3. From **8** take 4, 3, 5, 6.   From **9** take 6, 3, 4, 5, 7.

4. From **10** take 2, 5, 8, 4, 3, 6, 7, 9.   From **11** take 2, 4, 5, 3, 7, 6, 8, 9.

5. From **12** take 9, 5, 8, 7.   From **13** take 8, 5, 7, 6.

6. From **14** take 8, 9, 7, 6, 5.   From **15** take 7, 8, 9, 6.

7. From **16** take 9, 8, 7.   From **17** take 9, 8.   From **18** take 9.

8. Add:

a	b	c	d	e	f	g	h	i	j
3	5	7	6	5	3	5	8	5	8
5	2	2	3	4	2	3	1	2	1
4	3	3	4	6	2	4	0	4	0
3	5	4	4	2	4	1	3	2	9

9. Subtract:

15	17	16	15	14	15	13	17	18	16
9	8	9	8	9	7	8	9	9	7

<div style="text-align:center">❙❙ ❙❙ ❙❙   ❙❙❙ ❙❙❙ ❙❙❙   ❙❙❙❙ ❙❙❙❙ ❙❙❙❙</div>

1. $2 + 2 + 2 = 6$ $3 + 3 + 3 = 9$ $4 + 4 + 4 = 12$

    $3 \times 2 = 6$ $3 \times 3 = 9$ $3 \times 4 = 12$

2. How many are $5 + 5 + 5$? 3×5? $6 + 6 + 6$? 3×6?

3. Count by 3's to 18.

4. Build the table of 3's as you built the table of 2's.

5. Memorize this table:

$3 \times 1 = 3$	$3 \times 4 = 12$	$1 \times 3 = 3$	$4 \times 3 = 12$
$3 \times 2 = 6$	$3 \times 5 = 15$	$2 \times 3 = 6$	$5 \times 3 = 15$
$3 \times 3 = 9$	$3 \times 6 = 18$	$3 \times 3 = 9$	$6 \times 3 = 18$

6. Show with splints three 5's; five 3's.

Notice that $3 \times 5 = 5 \times 3$.

7. $3 \times 2 = 2 \times$? $3 \times 4 = 4 \times$? $3 \times 6 = 6 \times$?

8. In a classroom there are 3 rows of girls with 6 girls in each row. How many girls are there?

9. How much do 3 toys cost at 4 cents each?

10. A strip of carpet is 3 yards long. What is its length in feet?

11. How many pencils are there in three packages, each containing 6 pencils?

12. How much do 3 cards cost at 5 cents each?

13. Find with splints the answers to the following:

$3 \times 10 =$? $3 \times 7 =$? $3 \times 8 =$? $3 \times 9 =$?

$10 \times 3 =$? $7 \times 3 =$? $8 \times 3 =$? $9 \times 3 =$?

The Romans wrote their numbers with letters.

This is how they wrote the first twelve numbers:

I	II	III	IV	V	VI
1	2	3	4	5	6

VII	VIII	IX	X	XI	XII
7	8	9	10	11	12
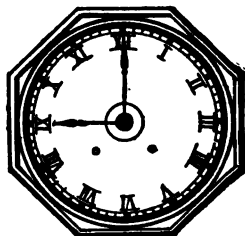
1. Find on the clock face the Roman numbers for 6, 8, 1, 9, 3, 2, 7, 5, 10, 12, 11.

On clock faces IIII is used for IV.

2. Read this Mother Goose rime:

> When **V** and **I** together meet
> They make the number **six** complete.
> When **I** with **V** does meet once more
> Then both together make but **four**;
> And when that **V** from **I** is gone,
> Alas! poor **I** can make but **one**.

3. Write the Roman number for 6.

4. Show what change in the letters for 6 will make the Roman number 4.

5. Write the Roman number for 7.

6. Write the Roman number for 9.

7. Read: V, IX, IV, III, VII, X, VI, VIII, XI, XII.

8. Write all the Roman numbers from 1 to 12.

1. Read the number of the chapter that begins on p. 27 of this book; on p. 81; on p. 225; on p. 313.

2. Which of the Roman numbers do you sometimes see on a nickel?

3. What change in the Roman number for 9 will make the Roman number for 11?

The short hand on the clock is called the **hour hand.** The long hand is called the **minute hand.**

4. What time is it by the clock in the picture on p. 38?

5. Make a clock face of cardboard and place the hands to show nine o'clock.

6. Move the hour hand to ten.   What time is it?

7. Move the hour hand to four.   What time is it?

8. Place the hands to show five o'clock; two o'clock; seven o'clock.

9. Show the position of the hands at 30 minutes after 9; at 30 minutes after 10; at 30 minutes after 11.

10. What time is it when the minute hand is at VI and the hour hand between I and II?

11. What time is it when the minute hand is at I and the hour hand just beyond XII?

12. Tell what time it is when the hour hand is at I and the minute hand at XII.

13. Place the hands to show at what time you got up this morning.

> **One fourth $\frac{1}{4}$**

1. || || || || Count the splints by twos.

2. How many splints are there?

3. Into how many groups are the splints divided?

4. Compare the groups as to the number in each.

5. Each group is called $\frac{1}{4}$ of 8.

6. How many splints are there in $\frac{1}{4}$ of 8 splints?

7. ||| ||| ||| |||
    $\frac{1}{4}$ of 12 $\frac{1}{4}$ of 12 $\frac{1}{4}$ of 12 $\frac{1}{4}$ of 12

    $\frac{1}{4}$ of 12 splints is — splints.

8. What name is given to each group?

9. How many inches are there in $\frac{1}{4}$ of a foot?

10. How many buttons are $\frac{1}{4}$ of a dozen?

11. I divided 12 cents equally among 4 boys. How much did each receive?

12. What is the cost of $\frac{1}{4}$ of a pound of sugar at 8 cents a pound?

13. Margaret found 8 peanuts in a peanut hunt. She ate $\frac{1}{4}$ of them. How many did she eat?

14. Which is greater, $\frac{1}{4}$ of 8 or $\frac{1}{2}$ of 8?

15. Complete: $\frac{1}{4}$ of 8 = ? $\frac{1}{4}$ of 12 = ?

> **2 pints = 1 quart**
> **2 pt. = 1 qt.**

For this exercise use real measures.

1. Fill the pint measure with water and empty it into the quart measure.

Do this a second time.

You have shown that **2 pints equal 1 quart.**
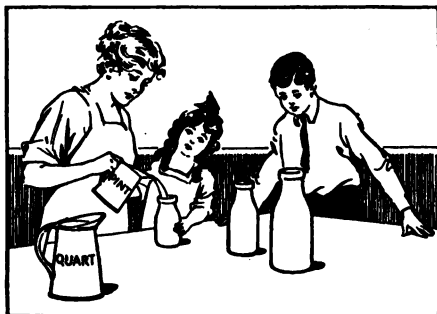
2. A quart is how many times a pint?

3. A pint is what part of a quart?

4. How many times can Mary's mother fill a half-pint milk bottle from the pint measure?

5. Charles gets a pint of milk each morning and evening. How many pints does he get in 2 days?

6. He pays 8 cents for a pint of milk. How much does he pay for a quart?

7. Raymond delivers each day 3 quart bottles of milk. How many pints does he deliver?

8. Henry goes to the store for 2 quarts of oil. How many pints does he get?

9. At 6 cents a pint, how much does a quart cost?
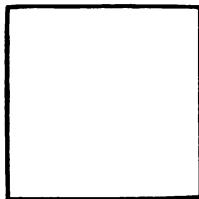
1. How many equal sides has this figure? how many square corners?

The figure is called a **square**.

2. Measure with your rule and tell the length of each side of this square.

3. Draw on paper and cut out several squares of different sizes.

4. What is the distance around a square that measures 2 inches on a side?

5. What is the distance around a square that measures 3 inches on a side?

6. How does this figure differ from a square? What kind of corners has it? It is called an **oblong**.
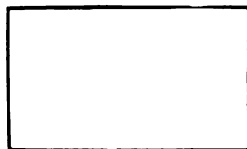
7. Draw on paper and cut out several oblongs of different sizes.

8. Draw an oblong 3 inches long and 2 inches wide. What is the distance around it?

9. How many sides has each of these figures? Such a figure is called a **triangle**.

10. Draw three triangles of different sizes on paper and cut them out.

11. What is the shape of a page of this book? of the top of your desk?

12. Tell the shapes of other objects in your school-room.

1. Cut an apple into 2 equal parts. What is one part called?

2. Into how many halves can an apple be cut? an orange? a pie?

One half of 1 is written $\frac{1}{2}$.

3. Cut an apple into 3 equal parts. What is 1 part called?

One third of 1 is written $\frac{1}{3}$.

4. Cut an apple into 4 equal parts. Each part is named one fourth or one quarter.

One fourth of 1 is written $\frac{1}{4}$.

5. How many fourths of an apple equal a whole apple?

6. Write in figures: one half; one third; one fourth.

7. Which is greater, $\frac{1}{2}$ of a circle or $\frac{1}{4}$ of the circle?

8. $\frac{1}{2}$ is equal to how many fourths?

9. I divided an apple equally among Grace, Ruth and Laura. What part of the apple did I give to each?

10. Draw a square and divide it into fourths.

11. If you eat $\frac{1}{2}$ of an apple, what part of the apple is left?

1. || || || || || Count the splints by 2's. How many times must 2 splints be taken to have 10 splints? 10 splints contain 2 splints —— times.

Show by separating into twos:

2. 6 contains 2 —*3*— times.   8 contains 2 —''—— times.   12 contains 2 —*6*— times.

<div align="center">

The sign ÷ means *divided by*.

$4 ÷ 2$ means 4 *divided by* 2.

</div>

3. Read and give the answers:

$4 ÷ 2 = ?$ $8 ÷ 2 = ?$ $12 ÷ 2 = ?$

$6 ÷ 2 = ?$ $10 ÷ 2 = ?$ $\frac{1}{2}$ of $12 = ?$

4. At 2 dollars a pair, how many pairs of gloves can be bought for 8 dollars?

5. How many quarts are there in 10 pints of milk?

6. How many 2-cent stamps can you buy for 8 cents?

7. There were 12 eggs in a box. Frank took them out of the box by 2's. How many times did he take out 2 eggs?

8. I have 6 thrift stamps. To how many boys can I give 2 stamps each?

9. 12 boys are marching by 2's. How many boys are there in each file?

10. How many 2's are there in 10? in 4? in 6?

11. How many 2's are there in 8? $8 ÷ 2 = ?$

1. Memorize this table : *

$2 \times 1 = 2$	$2 \div 2 = 1$	$2 \times 6 = 12$	$12 \div 2 = 6$
$2 \times 2 = 4$	$4 \div 2 = 2$	$2 \times 7 = 14$	$14 \div 2 = 7$
$2 \times 3 = 6$	$6 \div 2 = 3$	$2 \times 8 = 16$	$16 \div 2 = 8$
$2 \times 4 = 8$	$8 \div 2 = 4$	$2 \times 9 = 18$	$18 \div 2 = 9$
$2 \times 5 = 10$	$10 \div 2 = 5$	$2 \times 10 = 20$	$20 \div 2 = 10$

2. 2×8 cents $= ?$ $2 \times \$10 = ?$ 2×6 dolls $= ?$

3. 2×2 books $= ?$ 2×7 days $= ?$ 5×2 pins $= ?$

4. 2×4 balls $= ?$ 3×2 cents $= ?$ 2×9 cents $= ?$

5. How many are three 2's? four 2's? five 2's? six 2's? seven 2's? eight 2's? nine 2's? ten 2's?

6. Divide these numbers by 2 from left to right and from right to left:

    12,   18,   2,   6,   16,   10,   20,   8,   4,   14.

7. Copy and write the answers :

$2 \times 7 = ?$	$10 \div 2 = ?$	$16 \div 2 = ?$	$9 \times 2 = ?$
$2 \times 8 = ?$	$2 \times 6 = ?$	$3 \times 2 = ?$	$14 \div 2 = ?$
$18 \div 2 = ?$	$7 \times 2 = ?$	$12 \div 2 = ?$	$20 \div 2 = ?$
$8 \div 2 = ?$	$2 \times 10 = ?$	$5 \times 2 = ?$	$10 \times 2 = ?$
$6 \div 2 = ?$	$2 \times 3 = ?$	$2 \times 9 = ?$	$6 \times 2 = ?$
$4 \div 2 = ?$	$2 \times 4 = ?$	$2 \times 5 = ?$	$8 \times 2 = ?$

* From this point on, the multiplication tables will be presented in only one form. It is desirable, however, that both forms be taught together, to show that $2 \times 3 = 3 \times 2$, $2 \times 4 = 4 \times 2$, etc.
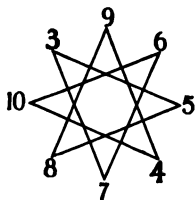
1. Make problems, using any of the numbers on the points of the star as the cost of one article and find the cost of 2 such articles at the same price.

2. To turn this wheel, the squirrel must find the products, one after another, beginning at the bottom.

If you were the squirrel, how quickly could you turn the wheel?

| 2X9 |
| 2X4 |
| 2X7 |
| 2X2 |
| 2X5 |
| 2X10 |
| 2X6 |
| 2X8 |
| 2X3 |
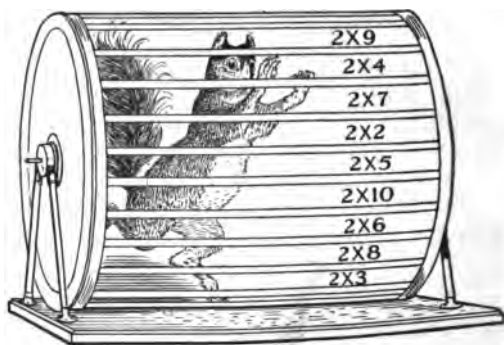
Memorize this table:

$3 \times 1 = 3$	$3 \div 3 = 1$	$3 \times 6 = 18$	$18 \div 3 = 6$
$3 \times 2 = 6$	$6 \div 3 = 2$	$3 \times 7 = 21$	$21 \div 3 = 7$
$3 \times 3 = 9$	$9 \div 3 = 3$	$3 \times 8 = 24$	$24 \div 3 = 8$
$3 \times 4 = 12$	$12 \div 3 = 4$	$3 \times 9 = 27$	$27 \div 3 = 9$
$3 \times 5 = 15$	$15 \div 3 = 5$	$3 \times 10 = 30$	$30 \div 3 = 10$

3. State the answers:

$3 \times 2 = 2 \times ?$

$3 \times 4 = 4 \times ?$

$8 \times 3 = ?$

$9 \times 3 = ?$

$5 \times 3 = ?$

$10 \times 3 = ?$

1. Count by 3's to 9 ; to 18.

2. How many times does 6 contain 3 ? ||| |||

3. Show by separating into groups :

12 contains 3 ——— times   15 contains 3 ——— times
18 contains 3 ——— times   21 contains 3 ——— times

4. State the answers :

$9 \div 3$ $18 \div 3$ $3 \div 3$ $12 \div 3$ $27 \div 3$
$24 \div 3$ $30 \div 3$ $21 \div 3$ $6 \div 3$ $15 \div 3$

5. Divide each number outside the circle by 3.

6. At 3 cents each, how many pencils can be bought for 21 cents?

7. Two dozen plates were arranged 3 in a pile. How many piles of plates were there?

8. Mary put 3 spoons at each place. She used 18 spoons. For how many persons did she set the table ?

9. Among how many children could I distribute 15 packages of seeds if I gave 3 packages to each ?

10. At 3 dollars a pound, how many pounds of knitting wool can be bought for 27 dollars ?

11. How many 3's are there in 30 ? in 6 ? in 21 ?

12. Divide each of these numbers by 3 : 27, 18, 15, 21, 9, 3, 12, 6, 24, 30.
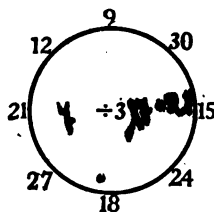
Find how long it takes you to get the *right answers* to each set of five examples.

I

1. $8+7=?$ $5+6=?$
2. 2×10 pints $= ?$ pints.
3. $—$ pt. $= 1$ qt.
4. Count by 5's to 100.
5. $18-9=?$ $15-7=?$

II

1. $21 \div 3=?$ $27 \div 3=?$
2. $3 \times 9=?$ $3 \times 10=?$
3. $—$ ft. $= 1$ yd.
4. Count by 10's to 100.
5. $17-8=?$ $9+8=?$

III

1. $—$ in. $= 1$ ft.
2. $20 \div 2=?$ $24 \div 3=?$
3. Count by 2's from 2 to 36; from 1 to 35.
4. $2+3+6=?$
5. What two numbers added make 9? 10? 11? 12? 13?

IV

1. 6 yd. $= ?$ ft.
2. $3 \times 6=?$ $2 \times 9=?$
3. Count by 3's from 3 to 30.
4. $30 \div 10=?$ $30 \div 3=?$
5. What two numbers added make 14? 15? 16? 17? 18?

V

1. $2+3+5+6=?$
2. 6 ft. $=$ how many yards?
3. $2 \times 10=?$ $2 \times 9=?$
4. $8+7=?$ $9+8=?$
5. $4+4+3=?$

VI

1. $14-5=?$ $11-7=?$
2. 8 qt. $=$ how many pints?
3. $13-5=?$ $13+5=?$
4. $9+?=13$; $11-?=7$.
5. $16-9=?$ $7+9=?$

CHAPTER III

1. One hundred one is written 101. Write in figures: one hundred four; one hundred seven.

2. The hundreds are written 100, 200, 300, 400, 500, 600, 700, 800, 900.

3. Read: In a poultry yard there were 415 hens which·had laid 365 eggs. 240 of .these eggs were bought by the grocer.

4. Read; then write from dictation: 109, 110, 308, 315, 506, 348, 836, 941, 707, 888.

The largest number of three figures is 999. The next number is one thousand, 1,000. The first figure on the right is called the **ones'** figure; the next is the **tens'** figure; the next is the **hundreds'** figure; the next is the **thousands'** figure. Thus, 625 is read *6 hundred 25*.

Write in figures:

5. Four hundred two.

6. Four hundred twenty.

7. Six hundred ninety.

8. Seventy-three.

9. Six hundred six.

10. One thousand.

Read ; then write from dictation :

	a	b	c	d	e	f	g
1.	305	542	740	8	70	79	400
	79	67	90	48	84	342	7
	6	500	708	600	395	24	49
	394	9	502	540	4	805	38
2.	562	807	60	536	28	42	62
	39	58	547	69	906	790	203
	645	36	44	25	627	37	636
	834	526	782	981	8	856	93
3.	390	300	29	66	602	90	65
	59	5	330	306	78	68	519
	508	794	57	27	909	80	398
	74	896	18	407	40	399	70
	380	26	901	92	23	76	55
4.	560	683	225	741	809	756	629
	47	999	888	777	666	555	444
	320	758	27	804	98	75	63
	843	431	401	905	229	386	457
	409	254	703	283	118	219	320
5.	403	333	222	111	908	728	354
	721	202	404	505	606	707	808
	82	303	321	329	422	523	624
	975	986	725	937	900	800	700
	64	329	826	848	550	640	230

Add rapidly :

	a	b	c	d	e	f	g	h	i	j
1.	5	4	3	2	1	9	8	7	6	8
	9	8	6	3	2	0	5	2	7	7
	0	1	2	5	6	2	6	7	9	3
	1	8	0	4	3	6	1	6	8	9
2.	8	3	6	8	5	6	3	8	4	3
	7	6	5	0	5	9	8	1	5	9
	2	5	9	9	8	2	7	3	2	9
	6	9	3	1	0	4	3	7	1	0

3. State the sums :

75	82	94	66	58	49	53	37
2	2	2	2	2	2	2	2

4. Add 3 to each number above instead of 2 ; then 4.

5. Add :

85	66	57	48	42	33	74	99
5	5	5	5	5	5	5	5

6. Add 6 to each number above instead of 5 ; then 7 ; then 8 ; then 9.

Find the sums :

7. 5 apples and 63 apples   **10.** 24 boys and 5 boys
8. 7 cakes and 42 cakes   **11.** 32 chairs and 6 chairs
9. 81 lemons and 7 lemons   **12.** 47 books and 2 books

1. Add 63 and 9.

63   Write 9 ones under 3 ones and add the ones'
9   column.
—
72   9 ones + 3 ones = 12 ones = 1 ten and 2 ones.

Write **2** under ones' column and add 1 to tens' column.
1 ten + 6 tens = 7 tens.   Write **7** under tens' column.
The answer is 72.

The process of uniting two or more numbers to form
one number is called **addition**.

The answer in addition is called the **sum**.

2. A boy spent 25 cents for a thrift stamp and 8
cents for a badge.   How much did he spend for both?

Add:

	a.	b	c	d	e	f	g	h
3.	59	49	88	36	47	42	54	48
	3	3	4	5	4	9	6	· 5
4.	27	48	36	59	65	74	82	59
	3	4	5	7	7	6	8	8

5. Memorize the following 45 addition facts:

```
1    2      2 3      3 4      3 4 5      4 5 6
1, 2 1, 3  2, 1, 4  2, 1, 5  3, 2, 1, 6  3, 2, 1, 7

4 5 6 7       5 6 7 8       5 6 7 8 9
4, 3, 2, 1, 8   4, 3, 2, 1, 9   5, 4, 3, 2, 1, 10

6 7 8 9       6 7 8 9         7 8 9
5, 4, 3, 2, 11   6, 5, 4, 3, 12     6, 5, 4, 13

7 8 9      8 9      8 9      9      9
7, 6, 5, 14  7, 6, 15  8, 7, 16  8, 17  9, 18
```

Add the two numbers in each oblong. Find how long it takes you to get the *right answers* to each set of five examples. Then work them again and try to improve your speed.

#						#					
1	5 / 4	15 / 4	25 / 4	35 / 4	45 / 4	**12**	6 / 4	56 / 4	66 / 4	76 / 4	86 / 4
2	7 / 4	17 / 4	27 / 4	37 / 4	47 / 4	**13**	8 / 4	58 / 4	68 / 4	78 / 4	88 / 4
3	9 / 4	19 / 4	29 / 4	39 / 4	49 / 4	**14**	5 / 5	55 / 5	65 / 5	75 / 5	85 / 5
4	6 / 5	16 / 5	26 / 5	36 / 5	46 / 5	**15**	7 / 5	57 / 5	67 / 5	77 / 5	87 / 5
5	8 / 5	18 / 5	28 / 5	38 / 5	48 / 5	**16**	9 / 5	59 / 5	69 / 5	79 / 5	89 / 5
6	6 / 6	16 / 6	26 / 6	36 / 6	46 / 6	**17**	7 / 6	57 / 6	67 / 6	77 / 6	87 / 6
7	8 / 6	18 / 6	28 / 6	38 / 6	48 / 6	**18**	9 / 6	59 / 6	69 / 6	79 / 6	89 / 6
8	7 / 7	17 / 7	27 / 7	37 / 7	47 / 7	**19**	8 / 7	58 / 7	68 / 7	78 / 7	88 / 7
9	9 / 7	19 / 7	29 / 7	39 / 7	49 / 7	**20**	6 / 8	56 / 8	66 / 8	76 / 8	86 / 8
10	7 / 8	17 / 8	27 / 8	37 / 8	47 / 8	**21**	8 / 8	58 / 8	68 / 8	78 / 8	88 / 8
11	9 / 8	19 / 8	29 / 8	39 / 8	49 / 8	**22**	9 / 9	59 / 9	69 / 9	79 / 9	89 / 9

1. Jean invited 14 girls and 9 boys to her party. How many children did she invite?

2. Frank sold 26 heads of lettuce from his garden on Monday, and 8 heads on Tuesday. How many heads of lettuce did he sell in the two days?

3. John was earning money for thrift stamps. He made 44 cents by selling papers after school and 9 cents on Saturday morning. How much did he make during the week?

4. Doris had 8 cents left after spending 25 cents for a thrift stamp. How much money had she at first?

5. How long did it take Philip to go from his home to school, if it took him 7 minutes to walk to the car and he rode for 29 minutes on the car?

6. The gardener planted 9 strawberry plants in one row, 8 in another, and 7 in a third row. How many plants were there in all?

7. Ruth earned 35 cents by weeding the garden and 7 cents by running errands. How much did she earn in all?

8. Four boys were sharpening pencils. One sharpened 5, another 8, another 6, and another 2. How many pencils did they all sharpen?

9. In a school playground there were 18 boys and 9 girls. How many children were there in the playground?

Subtract:

	a	b	c	d	e	f	g	h
1.	7	6	5	4	13	8	9	11
	4	5	2	3	8	4	5	3
2.	13	6	8	9	7	10	12	11
	6	3	3	7	2	7	4	5
3.	8	9	7	15	5	12	11	17
	6	8	5	7	4	9	7	9

What number must be added to the lower number to make the upper number?

4. 9	13	8	9	10	12	11	12
6	5	5	2	8	7	4	6
5. 13	14	10	12	9	10	11	15
9	8	9	2	3	4	8	8
6. 16	15	13	14	15	16	14	11
8	9	7	7	6	9	9	6

Give the answers quickly:

7. $7-6$ $17-6$ $27-6$ $37-6$ $47-6$

8. $13-7$ $23-7$ $33-7$ $43-7$ $53-7$

9. $15-8$ $25-8$ $35-8$ $45-8$ $55-8$

10. $26-9$ $36-9$ $46-9$ $56-9$ $66-9$

1. What number must be added to 6 to make 49 ?

$$\begin{array}{r} 49 \\ 6 \\ \hline 43 \end{array}$$

Write the example in this way.

Think 6 + **43** = 49.

Write **3** in ones' place and **4** in tens' place.
The answer is 43.

Subtract and test:

	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	44	38	56	64	49	65	98
	2	3	3	1	3	2	5
3.	58	65	68	57	69	86	75
	3	1	5	4	4	2	3
4.	77	88	75	96	87	94	89
	4	5	5	6	3	1	9
5.	67¢	59¢	88¢	97¢	76¢	85¢	47¢
	2¢	5¢	6¢	7¢	6¢	4¢	6¢

	a	*b*	*c*	*d*	*e*
6.	99 eggs	96 nuts	87 tops	79 pens	98 cups
	8 eggs	4 nuts	4 tops	8 pens	4 cups
7.	89 pads	94 caps	59 bags	97 pins	99 hats
	9 pads	1 cap	8 bags	2 pins	9 hats

8. Make and solve five more examples like those above.

1. David sold 14 thrift stamps and Walter sold 4. How many more did David sell than Walter?

2. Edna spent 4 cents for pencils. She gave the clerk 25 cents. How much change should she receive?

3. Ada knitted a sweater. She purled 8 inches and knit 38 inches plain. How many more inches were knit plain than purled?

4. Arthur lived 68 miles from the city. After he had gone 4 miles toward the city, how many miles had he still to travel?

5. John drove 29 cows and Peter drove 8 cows. How many more cows were there in John's herd than in Peter's?

6. Clara had 36 pieces in her doll's dinner set, but 5 plates were lost. How many pieces remained?

7. Philip had 76 radishes in his garden and pulled up 4 radishes. How many radishes were left in the garden?

8. William rode 29 miles on his bicycle on Thursday and 8 miles on Friday. How much farther did he ride on Thursday than on Friday?

9. From a class consisting of 37 children, 6 children were absent. How many were present?

10. Make problems about:

pupils	dollars	pictures	lamps	books
46 − 4	37 − 4	63 − 2	48 − 6	73 − 2
56 − 3	68 − 3	84 − 4	46 − 4	39 − 5

1. What number must be added to 5 to make 60?

60 Write the example in this way.
 5
55   Think $5 + 55 = 60$.

The process of finding the difference between two numbers, or finding what must be added to a number to make a given number, is called **subtraction**.

The number from which we subtract is called the **minuend**.

The number subtracted is called the **subtrahend**.

The answer in subtraction is called the **difference** or **remainder**.

Subtract:

	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	60	90	50	40	30	70	80
	7	3	8	4	9	7	6
3.	40	30	50	80	90	60	70
	2	6	5	9	7	4	8
4.	20	70	70	60	70	90	90
	5	4	3	2	1	9	8
5.	50	80	60	50	40	30	20
	6	7	8	9	5	4	3

6. Our baseball team played 20 games and lost 9 games. How many did they win?

7. Martha bought 1 yard of ribbon for 8¢ and handed the clerk 50¢. How much change did she get?

8. Make a number story about 90¢ less 5¢.

1. What number must be added to 5 to make 83?

$\begin{array}{r} 83 \\ 5 \\ \hline 78 \end{array}$ Write the example in this way.

Think $5 + 78 = 83$.

Subtract:

	a	b	c	d	e	f	g
2.	63	92	84	57	85	34	91
	7	9	9	8	9	7	4
3.	48	76	81	63	92	86	84
	9	7	9	4	4	8	5
4.	56	85	31	61	21	34	44
	9	7	8	7	3	6	8
5.	25¢	57¢	93¢	42¢	58¢	23¢	47¢
	8¢	7¢	5¢	6¢	9¢	6¢	9¢
6.	32¢	71¢	81¢	86¢	97¢	82¢	73¢
	5¢	2¢	5¢	6¢	8¢	8¢	9¢
7.	59¢	53¢	54¢	55¢	56¢	58¢	57¢
	8¢	6¢	5¢	8¢	7¢	9¢	8¢
8.	87¢	86¢	82¢	93¢	81¢	85¢	94¢
	9¢	9¢	7¢	6¢	8¢	6¢	8¢

9. Peter saved 7¢. How much more did he need for a 25-cent thrift stamp?

10. Alice counted 36 radishes in her garden one morning. She pulled 9. How many remained?

11. Make a number story about 65¢ less 8¢.

1. It takes 20 stamps to fill a card with war savings stamps. Walter had 4 stamps. How many more did he need to fill the card?

2. Alice had 33 stitches on her knitting needle and bound off 8 stitches. How many stitches were left?

3. Frank's garden contained 72 radishes. He pulled 9 radishes. How many radishes were left in the garden?

4. Our classroom seats 46 pupils. How many seats were filled when 7 pupils were absent?

5. A farmer had 41 cows. He sold all but 9 cows. How many cows did he sell?

6. Hazel had 63 cents. She paid 5 cents for a stamp. How much money had she left?

7. Katherine bought a box of crayons for 8 cents. How much had she left from 50 cents?

8. A shelf of the school library contained 40 books. How many remained after 6 books were taken away?

9. Philip had 8 stamps in his collection on April 1 and 72 stamps on May 1. How many stamps did he collect during the month?

10. Emily's necklace contained 91 beads. How many beads were left after she had lost 7 beads?

11. James was saving money for a 50-dollar Liberty bond. After he had saved 9 dollars, how much more did he need?

United States money is written in **dollars** and **cents**.

A period (.), named a "**decimal point**," is placed to the right of dollars. · After the point, cents are written in two places. Thus, 5 *dollars* and 25 *cents* is written $ 5.25; 5 *cents* is written $ .05; 42 *cents*, $ .42.

1. Read the prices in the first two columns. Write the others with the dollar sign.

Doll, $.74	Book, $1.55	Pear, 5¢	Tray, 95¢
Ball, $.16	Boat, $2.05	Plum, 2¢	Tie, 48¢
Top, $.08	Horn, $ .35	Melon, 15¢	Socks, 74¢

Read; then write from dictation:

2.	$3.40	$ 2.24	$3.14	$3.62	$2.83
3.	$2.61	$ 3.36	$1.35	$2.05	$3.57
4.	$2.43	$ 3.25	$9.41	$7.09	$5.13
5.	$1.47	$ 2.46	$2.16	$5.26	$4.08
6.	$3.46	$ 3.05	$8.49	$6.11	$6.03
7.	$1.25	$ 2.74	$2.56	$2.65	$4.79

8. $ 24 + $ 8 = ?

$24
   8
‾‾‾‾
$ 32

Write the dollar sign only with the first number and with the answer.

9. Copy and add: **10.** Copy and subtract:

$37	$42	$78	$25	$40	$92	$53	$86
6	9	4	6	6	5	7	4

Write in columns, placing the points under one another.

11. $4.60, $3.28, $.42.   **12.** $.53, $21.40, $ 3.75, $ 5.

1. Review the table of 2's to 2 × 10.

2. Learn : **2 × 11 = 22.**   **2 × 12 = 24.**

3. How many are two 6's ?   2 × 6 cents = ?

2 × 6 = 12 may also be written   6   6 cents
in this way :   2   2
                                     ───   ─────────
                                      12   12 cents

4. Multiply :

4	8	6	7	12	5	9	11	10	3
2	2	2	2	2	2	2	2	2	2

5. How many are two 34's ?   2 × 34 ¢ = ?

```
   34              34 ¢
   34              34 ¢
  ───             ─────
   68              68 ¢
```

6. A short process of finding two 34's is as follows :
Write the 2 under the right-hand figure of the num-
ber to be multiplied, which is 34

```
34      Ones.  Think 2 × 4 = 8.  Write 8.      34 ¢
 2      Tens.  Think 2 × 3 = 6.  Write 6.       2
───     The answer is 68.                      ────
68                                             68 ¢
```

Test.   **34 + 34 = 68.**

Multiply :

	a	b	c	d	e	f
7.	23	54	53	64	93	71
	2	2	2	2	2	2
8.	42 ¢	81 ¢	94 in.	74 qt.	63 ft.	53 yd.
	2	2	2	2	2	2

1. Review the table of 3's to 3×10.

2. Learn: $3 \times 11 = 33$. $3 \times 12 = 36$.

Multiply rapidly :

3.
7	9	8	6	10	12	11	20	30
3	3	3	3	3	3	3	3	3

4. Multiply 65 by 3.

65
3
195

Ones. $3 \times 5 = 15$. Write **5.** Carry or add 1 to the tens.

Tens. $3 \times 6 = 18$; $18 + 1$ (carried) $= 19$. Write **19.**
The answer is 195.
Think: $3 \times 5 = 15$; $3 \times 6 = 18$; $18 + 1 = 19$.
The result, 195, is called the **product.**

5. Multiply 165 by 3.

165
3
495

Ones. $3 \times 5 = 15$. Write **5.** Carry 1.
Tens. $3 \times 6 = 18$; $18 + 1 = 19$. Write **9.** Carry 1.
Hundreds. $3 \times 1 = 3$; $3 + 1 = 4$. Write **4.**

The product is 495.

$1 \times 0 = 0$; $2 \times 0 = 0$; $3 \times 0 = 0$. **Any number of times $0 = 0$.**

Multiply :

	a	*b*	*c*	*d*	*e*
6.	40	75	66	74	80
	3	3	3	3	3
7.	130	105	216	308	207
	3	3	3	3	3
8.	236 ¢	300 yd.	237 in.	258 ft.	189 ¢
	3	3	3	3	3

1. Philip earned $24 a month by helping a farmer. How much did he earn in 2 months?

2. Find the cost of 2 rakes at 80 ¢ each.

3. Mary canned 14 jars of peaches. Her mother canned twice as many jars. How many jars did her mother can?

4. Find the cost of 2 pints of molasses at 14 cents a pint.

Find the cost of:

5. 2 pieces of soap at 10 cents apiece.

6. 2 garden forks at 44 cents each.

7. 2 dozen buttons at 12 cents a dozen.

8. 2 yards of ribbon at 11 cents a yard.

9. How many inches are there in 3 feet?

10. An automobile ran 21 miles an hour. How far did it go in 3 hours?

11. Harold bought 3 notebooks at 16 cents each. How much did they cost?

12. Andrew sold 3 dozen eggs at 60 cents a dozen. How much did he receive for them?

13. Find the cost of 3 rugs at 24 dollars each.

14. Three girls bought trowels for their gardens. They cost 15 cents each. How much did the 3 trowels cost?
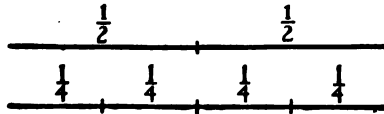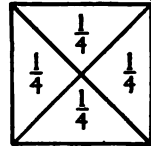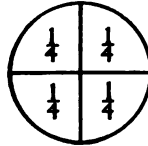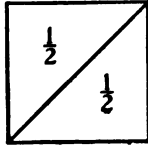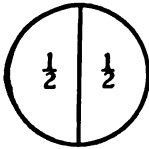
1. How many halves of a circle are there in a circle?

2. How many halves of a square are there in a square?

3. How many halves of a line are there in a line?

4. How many halves are there in a unit or one of *anything?*

5. How many fourths of a circle are there in a circle? how many fourths of a square in a square? how many fourths of a line in a line?

6. How many fourths are there in a unit or one of *anything?*

7. How many thirds of a circle are there in a circle? how many thirds of a square in a square? how many thirds of a line in a line?

8. How many thirds are there in a unit or one of *anything?*
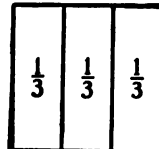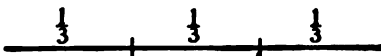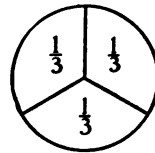
Measure carefully with your ruler and draw:

1. An envelope 2 inches wide and 4 inches long.
2. A blotter 3 inches wide and 6 inches long.
3. A page 4 inches wide and 6 inches long.
4. A square 3 inches on a side.
5. A square 4 inches on a side.
6. The top of a square box 5 inches on a side.
7. A picture 4 inches by 6 inches.

Let 1 inch stand for 1 foot, and draw figures to represent:

8. A rug 3 feet wide and 8 feet long.

NOTE. As 1 inch stands for 1 foot, 3 inches stand for 3 feet, and 8 inches for 8 feet. Draw an oblong 3 inches wide and 8 inches long.

9. A hallway 4 feet wide and 10 feet long.
10. A table cover 4 feet wide by 7 feet long.
11. A window glass 4 feet by 9 feet.
12. A blackboard 3 feet by 6 feet.

Let 1 inch stand for 1 yard, and draw figures to represent:

13. A room 4 yards by 6 yards.
14. A porch floor 2 yards wide and 8 yards long.
15. A hallway 3 yards wide and 12 yards long.
16. A rug 3 yards wide and 5 yards long.
17. A porch rug 2 yards wide and 4 yards long.
18. A wall 3 yards in height and 6 yards long.

1. How many tens make twenty? One ten is what part of 20?

One half of *twenty* is ten.

One half of *four* is two.

What is one half of *twenty-four?*

2. $\frac{1}{2}$ of $20 = 10$ $\Big|$ $\frac{1}{2}$ of $26 = 13.$
$\frac{1}{2}$ of $\ 6 = \ 3$

3. Find in the same way $\frac{1}{2}$ of 28.

4. How many sevens are twenty-one? One seven is what part of twenty-one? $\frac{1}{3}$ of $21 = 7.$

5. How many eights are 24?

One eight is what part of 24? $\frac{1}{3}$ of $24 = 8.$

6. How many are three nines?

One nine is what part of 27? $\frac{1}{3}$ of $27 = 9.$

7. How many tens are thirty? How much is $\frac{1}{3}$ of 30?

$\frac{1}{3}$ of $30 = 10$ $\Big|$ $\frac{1}{3}$ of $33 = 11.$
$\frac{1}{3}$ of $\ 3 = \ 1$

8. Find $\frac{1}{3}$ of 36 by finding $\frac{1}{3}$ of 30 and $\frac{1}{3}$ of 6.

9. I divided 39 cents equally among 3 boys. How much did each receive?

10. Three girls together made 27 bandages. Each girl made the same number. How many did each make?

11. Mother divided 21 cookies equally among 3 children. How many did each get?

1. Into how many groups of 2 apples each may 10 apples be divided?

10 divided by 2 equals 5 is written $10 \div 2 = 5$, or $2\overline{)10}$.

$$0 \div 1 = 0; \ 0 \div 2 = 0; \ 0 \div \text{any number} = 0.$$

$\frac{}{5}$

Read, and give the answers:

2. $4 \div 2; \ 6 \div 2; \ 8 \div 2; \ 10 \div 2; \ 12 \div 2; \ 14 \div 2; \ 16 \div 2.$

3. $2\overline{)8}$ $2\overline{)10}$ $2\overline{)6}$ $2\overline{)12}$ $2\overline{)14}$ $2\overline{)16}$ $2\overline{)18}$

4. Divide 24 by 2.

$2\overline{)24}$ 2 is contained in 2, 1 time.   Write **1** below the 2.

$\overline{12}$ 2 is contained in 4, **2** times.   Write **2** below the 4.

Think:

Tens. 2 in 2, **1** time.   Write **1**.

Ones. 2 in 4, **2** times.   Write **2**.

Find the answers:

	a	b	c	d	e
5.	$2\overline{)22}$	$2\overline{)24}$	$2\overline{)26}$	$2\overline{)44}$	$2\overline{)20}$
6.	$2\overline{)28}$	$2\overline{)40}$	$2\overline{)48}$	$2\overline{)42}$	$2\overline{)46}$
7.	$2\overline{)62}$	$2\overline{)66}$	$2\overline{)60}$	$2\overline{)84}$	$2\overline{)88}$

8. How many quarts are there in 44 pints?

9. Arnold counted 84 eggs by 2's. How many times did he take out 2 eggs?

10. Divide by 2: 244; 462; 684; 240; 408; 800.

1. The answer in division is called the **quotient**.

2. 24¢ ÷ 3¢ means that we are to find *how many times* 3 cents is contained in 24 cents.   3¢)24¢
3 cents is contained 8 times in 24 cents.   **8 times.**

Find the quotients:

3. 82 days ÷ 2 days   9. 189 years ÷ 3 years

4. 186 hours ÷ 3 hours   10. 244 stamps ÷ 2 stamps

5. 422 minutes ÷ 2 minutes 11. 664 cents ÷ 2 cents

6. 488 feet ÷ 2 feet   12. 336 quarts ÷ 3 quarts

7. 249 inches ÷ 3 inches   13. 144 dozen ÷ 2 dozen

8. 622 dollars ÷ 2 dollars 14. 428 pints ÷ 2 pints

15. 24¢ ÷ 3 means that we are to find *one third* of 24¢; thus, ⅓ of 24¢ equals 8¢.   3)24¢
                                          8¢

Find the quotients:

16. 224 days ÷ 2   24. 844 dozen ÷ 2

17. 333 cents ÷ 3   25. 646 quarts ÷ 2

18. 216 dollars ÷ 3   26. 969 pencils ÷ 3

19. 622 birds ÷ 2   27. 842 books ÷ 2

20. 326 inches ÷ 2   28. 936 hours ÷ 3

21. 219 hours ÷ 3   29. 288 pages ÷ 2

22. 444 beads ÷ 2   30. 428 pints ÷ 2

23. 468 minutes ÷ 2   31. 639 pens ÷ 3

Divide:

	a	b	c	d
1.	3)24	3)36	3)27	3)30
2.	3)393	3)363	3)339	3)933

3. Compare $8 \div 2$ and $\frac{1}{2}$ of 8; $12 \div 2$ and $\frac{1}{2}$ of 12.

4. Compare $9 \div 3$ and $\frac{1}{3}$ of 9; $12 \div 3$ and $\frac{1}{3}$ of 12.

5. Compare $24 \div 2$ and $\frac{1}{2}$ of 24; $36 \div 3$ and $\frac{1}{3}$ of 36.

6. How do you find $\frac{1}{2}$ of any number? $\frac{1}{3}$ of any number?

7. Find $\frac{1}{2}$ of 208 boys.   **8.** Find $\frac{1}{3}$ of 312 girls.

2)208
104

3)312
104

How many are:

	a	b	c
9.	$\frac{1}{3}$ of 240 men?	$\frac{1}{3}$ of 159 balls?	$\frac{1}{2}$ of 484?
10.	$\frac{1}{3}$ of 306 feet?	$\frac{1}{2}$ of 216 plants?	$\frac{1}{3}$ of 927?
11.	$\frac{1}{3}$ of 318 yards?	$\frac{1}{3}$ of 324 sheep?	$\frac{1}{2}$ of 806?
12.	$\frac{1}{3}$ of 915 books?	$\frac{1}{2}$ of 802 inches?	$\frac{1}{3}$ of 216?.

13. Alice paid 80 cents for 2 watering cans of the same value. How much did each cost?

14. A family bought 48 pints of milk in a month. How many quarts did they buy?

15. How many 2-cent picture postcards can be bought for 64 cents?

16. A boy earned $88 in 2 months by cleaning automobiles. How much did he earn each month?

17. John had 96 cents. He spent $\frac{1}{3}$ of his money for seeds. How much did the seeds cost?

Hard Tack

3	4	5		2	3	6		6	5	4
3	2	1		5	4	1		2	3	4
6	5	7		8	4	7		6	7	8
3	4	2		2	6	3		5	4	3
6	8	9		8	9	7		5	8	9
7	5	4		6	5	7		7	4	3

EXPLANATION OF HARD TACK

At the beginning of the game each pupil holds six cards spread out in his hand so that his neighbor cannot see them. The first child draws a card from his neighbor on the right and in turn permits his left-hand neighbor to draw a card from him. When a child holds three cards, each of which is equal to the same sum, he lays them on the table.

HARD TACK

15	16
17	18

The game continues, one child drawing from another until all the cards but one have been matched. At the end of the game the child holding the one card "Hard Tack" must give all the combinations by addition of two numbers less than ten, which make the numbers on "Hard Tack."

How Do I Know Your Answer?

Select a number less than 10. Add 3 to it.

Multiply the sum by 2. Divide the product by 2.

Subtract from the quotient the number that you selected. Your answer is 3.

1. Show by adding four 2's that $4 \times 2 = 8$; show by adding four 3's that $4 \times 3 = 12$, and so on.

2. Count by 4's to 24; to 48.

3. Build the table of 4's as you built the table of 3's.

4. How many are 3 times 4? 4 times 3? How many are 5 times 4? 4 times 5?

5. $6 \times 4 = ?$ $4 \times 6 = ?$ $7 \times 4 = ?$ $4 \times 7 = ?$

6. How many are 12 times 4? 4 times 12?

7. Memorize this table:

$4 \times 1 = 4$	$4 \times 7 = 28$
$4 \times 2 = 8$	$4 \times 8 = 32$
$4 \times 3 = 12$	$4 \times 9 = 36$
$4 \times 4 = 16$	$4 \times 10 = 40$
$4 \times 5 = 20$	$4 \times 11 = 44$
$4 \times 6 = 24$	$4 \times 12 = 48$

8. $4 \times 2 = 2 \times ?$　　$4 \times 5 = 5 \times ?$　　$4 \times 9 = 9 \times ?$

9. $4 \times 8 = 8 \times ?$　　$4 \times 6 = 6 \times ?$　　$4 \times 7 = 7 \times ?$
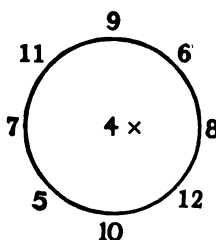
10. Multiply each number outside the circle by 4.

11. Find the cost of 8 pencils at 4 cents each.

12. Each of 4 boys earned 10 cents by carrying a bag. How much did they all earn?

13. How many eggs are there in 4 boxes, each of which contains 1 dozen eggs?

1. Give the products rapidly:

8	5	7	9	11	10	4	6	12
4	4	4	4	4	4	4	4	4

2. 4×5 8×4 4×10 4×7 9×4

3. 5×4 4×11 4×3 4×12 4×4

4. 4×2 4×6 6×4 4×9 4×8

5. Agnes had 4 pieces of ribbon of 10 yards each. How many yards had she in all?

6. How far can Thomas walk in 4 hours if he walks 3 miles an hour?

7. At 8 cents a pound how much will 4 pounds of sugar cost?

8. How many days are there in 4 weeks?

Multiply:

	a	b	c	d	e	f
9.	65	38	23	69	48	56
	4	4	4	4	4	4
10.	93	87	74	75	86	98
	4	4	4	4	4	4
11.	82	60	105	207	190	200
	4	4	4	4	4	4
12.	234	175	208	70	99	160
	4	4	4	4	4	4

1. How many are four 2's?   4 in 8 ——— times.

2. How many are four 3's?   4 in 12 ——— times.

3. How many times does 16 contain 4?

4. 20 contains 4 ——— times;   24 contains 4 ——— times;   48 contains 4 ——— times.

5. 32 + 4 = ?   36 + 4 = ?   44 + 4 = ?   48 + 4 = ?

6. Give the quotients.   7. Give the parts.
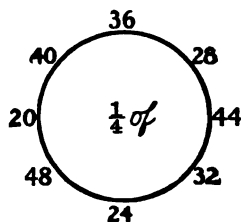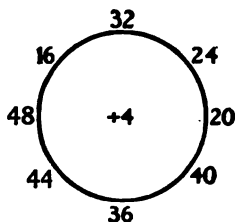
Divide, and test by multiplication:

8. 4)44   4)48   4)844   4)804   4)404

9. 4)248   4)328   4)400   4)448   4)436

10. Find $\frac{1}{4}$ of each of the following numbers:

a	b	c	d	e
244	848	200	408	224
236	836	832	816	220
288	168	240	164	840
440	124	280	204	232

11. There are 824 pages in 4 books.   Each book has the same number of pages.   How many pages has each book?

Saving Money for Thrift Stamps

1. A thrift stamp costs 25 cents. How much do 2 thrift stamps cost? 3 thrift stamps? 4 thrift stamps?

2. At 35 cents a week how much did Robert save in 4 weeks by staying away from moving pictures?

3. On Monday we collected 4 cents from each of 115 pupils for our War Savings Club. How much did we collect?

4. It takes 16 thrift stamps to fill a thrift card. How many stamps will fill $\frac{1}{2}$ of a card? $\frac{1}{4}$ of a card?

5. Robert earned 96 cents one week by carrying traveling bags. He saved $\frac{1}{4}$ of it. How much did he save?

6. Edith received $2, or 200 cents, on her birthday and spent $\frac{1}{4}$ of it for thrift stamps. How much did she spend for stamps?

7. Edith stopped buying candy. She saved 4 cents a day for 12 days. How much did she save? How much more did she need for 2 thrift stamps?

8. Robert handed the post-office clerk 3 dimes and asked for a thrift stamp. How much change did he get?

9. Edith earned 27 cents one week by washing dishes and 7 cents by running errands. She bought a thrift stamp for 25 cents. How much money had she left?

Find how long it takes you to get the *right answers* to each set of five examples.

I

1. $8 + 6 + 4 + 7 = ?$
2. $4 \times 209 = ?$
3. Subtract 7 from 72.
4. Divide 800 by 4.
5. Find $\frac{1}{4}$ of 480.

II

1. $\frac{1}{3}$ of $150 = ?$
2. $83 - 7 = ?$
3. $3 + 8 + 9 + 7 = ?$
4. Multiply 208 by 4.
5. 8 qt. = ? pt.

III

1. $26 - 9 = ?$
2. Divide 168 by 4.
3. Add 4, 6, 8, 7.
4. Find the product of 38 and 4.
5. Draw a rug 3 in. by 2 in., on a scale of 1 ft. to 1 in.

IV

1. $248 + 4 = ?$
2. 1 yd. = ? ft.
3. $3 \times 296 = ?$
4. Find the difference between 91 and 8.
5. Write in words nine hundred eighty-nine.

V

1. $4 \times 126 = ?$
2. Find $\frac{1}{4}$ of 128.
3. Take 6 from 82.
4. Find $\frac{1}{2}$ of 486.
5. Divide 915 by 3.

VI

1. 1 ft. = ? in.
2. $52 - 5 = ?$
3. $3 \times 247 = ?$
4. $47 + 9 = ?$
5. Find $\frac{1}{3}$ of 639.

CHAPTER IV

1. Read: Ida picked 295 daisies.

2. Add 1 to 1000. The sum is one thousand one, written 1001.

3. The thousands are written 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000.

Write in figures:

4. One thousand nine.

6. Four thousand eight.

5. Two thousand six.

7. Nine thousand three.

The first figure on the right is called the **ones'** figure; the next is called the **tens'** figure; the next is called the **hundreds'** figure; the next is called the **thousands'** figure. 1625 is read *1 thousand 6 hundred 25.*

8. Read: Our class gathered 8056 daisies.

9. Read; then write: 1025, 2040, 7008, 9456, 8099.

Write as one number:

10. 6 hundreds, 4 tens, 8 ones.

11. 8 thousands, 5 hundreds, 0 tens, 3 ones.

12. 4 thousands, 0 hundreds, 0 tens, 5 ones.

1. Read the following numbers:

a	b	c	d	e
4372	7000	4467	5100	3131
1064	2307	9103	23	2030
2007	2510	209	2900	4659
3365	8064	9023	1001	1111

2. Write from dictation:

a	b	c	d
4627	3040	2671	3708
2000	1005	8400	5060
3056	7632	5047	7298
4900	8030	6039	6543

3. Read: In one year my father spent $356.75 for food, $254.50 for rent, and $187.05 for clothing.

4. Read: An airplane made a flight of 5700 miles at the rate of 80 miles an hour. It carried 1200 gallons of gasoline, which was enough for a flight of 16 hours.

5. Write from dictation: 5603 Liberty motors were turned out in October, 1918.

6. Read:

a	b	c	d
$246.25	$632.75	$327.56	$805.96
$318.75	$738.49	$928.89	$613.73
$92.48	$918.86	$738.86	$928.45
$18.64	$29.94	$198.37	$56.91
$178.84	$219.35	$165.27	$214.56
$6.92	$7.29	$86.15	$3.94
$175.49	$216.87	$283.85	$69.47

1. Find the sum of 52 and 27.

52
27
——
79

Write *ones* in *ones'* column and *tens* in *tens'* column. Then add the columns thus:

Ones. 7 + 2 = 9. Think 9. Write **9**.

Tens. 2 + 5 = 7. Think 7. Write **7**. The answer is 79.

Test by adding downwards.

Add upwards; test by adding downwards:

	a	b	c	d	e	f	g
2.	20	30	40	50	60	30	50
	30	10	10	20	10	40	30
3.	31	21	23	32	12	30	69
	12	32	13	23	33	13	20
4.	32	15	43	67	83	65	62
	16	13	31	11	11	22	30
5.	$45	$25	$35	$34	$42	$55	$44
	14	33	54	35	45	33	22
6.	45¢	71¢	47¢	76¢	38¢	38¢	29¢
	20¢	13¢	31¢	10¢	40¢	20¢	50¢

Only numbers having **like names** can be added or subtracted.

	a	b	c	d	e
7.	17 boys	36 caps	56 balls	35¢	46 ft.
	12 boys	21 caps	32 balls	24¢	22 ft.

1. Add 38 and 24.

38   *Ones.* Think 12. Write **2.** *Carry* 1 to tens'
24 column.
62   . *Tens.* Think 3, 6. Write **6.**

The answer is 62.

Add and test:

	a	b	c	d	e	f	g
2.	36	47	42	54	48	35	64
	25	24	39	36	34	27	28
3.	46	19	29	18	38	17	39
	36	24	10	36	17	46	45
4.	19	21	32	23	31	42	13
	14	19	4	15	43	16	46
	3	12	16	6	8	17	18
5.	11	16	19	41	39	42	15
	31	10	20	23	20	18	41
	29	49	17	18	18	20	38
6.	30	40	32	9	8	15	13
	17	19	30	14	20	20	68
	28	34	9	16	9	38	14

NOTE TO THE TEACHER. To save the labor of copying, the pupils may occasionally be directed to write their answers on a sheet of paper placed beneath a row of examples. Copying should not be entirely neglected, however, since the habit of carefulness in copying is an important element in accuracy.

1. Richard made $24 on his school garden and earned $17 by washing automobiles. How much money did he earn in all?

2. A farmer sold 26 bushels of apples on Monday, 35 bushels on Tuesday, and 30 bushels on Wednesday. How many bushels did he sell in the three days?

3. On Tuesday a newsboy sold 28 morning papers and 44 evening papers. How many papers did he sell on that day?

4. Dora had 42 cents left after spending 28 cents for buttons and 10 cents for pins. How much money had she at first?

5. One month my father spent $24 for rent, $65 for food, and $12 for other items. How much did all cost?

6. John planted 29 potatoes in one row, 31 in another row, and 33 in a third row. How many potatoes did he plant?

7. Paul spent 35¢ for a ball, 25¢ for a bat, and 10¢ for car fare. How much did he spend?

8. On a picnic each girl spent 15¢ for car fare, 20¢ on the roller coaster, 35¢ in the picture gallery, and 12¢ for popcorn. How much did each girl spend?

9. It took Mary 16 minutes to sweep and dust the library, 12 minutes for the dining room, and 23 minutes for the parlor. How long did it take for the three rooms?

10. Agnes canned 43 jars of fruit and Martha canned 27 jars more than Agnes. How many jars did both can?

Peter and Polly's Country Walk
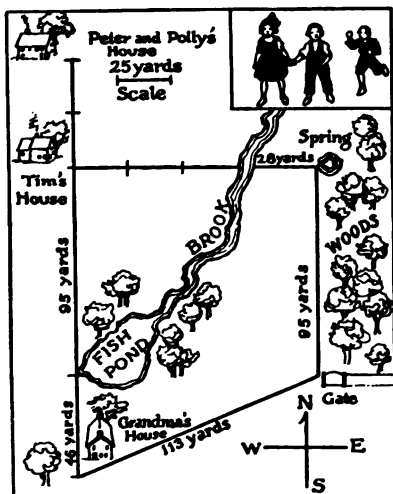
1. Peter and Polly start out for a walk. They stop for Tim. How far is it to Tim's house, if each line ⊢——⊣ stands for 25 yards?

2. How far is it from Tim's house to the brook?

3. They walk 28 yards further east to the spring. How far is it from Tim's house to the spring?

4. From the spring they walk 95 yards south through the woods. Then they cut across lots 113 yards from the gate and reach grandma's house. How far do they walk from the spring to grandma's house?

5. The distance north from grandma's house to the fish pond is 46 yards; from the fish pond to Tim's house, 95 yards; and from Tim's house to Peter's house, 50 yards. How far is it from grandma's to Peter's house?

6. How much farther is it from Tim's house to grandma's than from Peter's house to Tim's?

7. What is the total length in yards of Peter and Polly's walk by the time they reach home? What is the total length in feet?

1. Tell rapidly how much must be added to the lower number to make the upper number.

14	9	13	12	13	16	16	10	15
9	5	8	7	4	7	8	5	7
11	13	17	15	7	14	13	10	10
2	7	8	9	5	6	5	8	3
11	12	11	10	18	9	11	15	11
3	9	8	7	9	3	6	8	7
12	14	14	10	12	17	12	10	13
3	7	5	4	4	9	6	9	9
11	15	11	16	14	12	12	10	13
5	6	4	9	8	5	8	6	6

Subtraction by Endings

2. Subtract rapidly:

a	b	c	d
$11 - 2 = ?$	$10 - 9 = ?$	$17 - 8 = ?$	$13 - 7 = ?$
$21 - 2 = ?$	$30 - 9 = ?$	$27 - 8 = ?$	$33 - 7 = ?$
$41 - 2 = ?$	$40 - 9 = ?$	$37 - 8 = ?$	$43 - 7 = ?$
$31 - 2 = ?$	$60 - 9 = ?$	$57 - 8 = ?$	$53 - 7 = ?$
$71 - 2 = ?$	$70 - 9 = ?$	$77 - 8 = ?$	$83 - 7 = ?$

e	f	g	h
$12 - 8 = ?$	$13 - 5 = ?$	$13 - 9 = ?$	$12 - 7 = ?$
$32 - 8 = ?$	$23 - 5 = ?$	$63 - 9 = ?$	$22 - 7 = ?$
$42 - 8 = ?$	$83 - 5 = ?$	$43 - 9 = ?$	$42 - 7 = ?$
$82 - 8 = ?$	$33 - 5 = ?$	$83 - 9 = ?$	$62 - 7 = ?$
$62 - 8 = ?$	$93 - 5 = ?$	$73 - 9 = ?$	$52 - 7 = ?$

1. Subtract 24 from 59.

$\frac{\begin{array}{r} 59 \\ 24 \end{array}}{35}$ Write the smaller number under the larger number with *ones* under *ones* and *tens* under *tens*.

FIRST METHOD *	SECOND METHOD *
Think :	Think :
Ones. $4 + 5 = 9$. Write **5**.	*Ones.* $9 - 4 = $ **5**. Write **5**.
Tens. $2 + 3 = 5$. Write **3**.	*Tens.* $5 - 2 = $ **3**. Write **3**.
Test. $35 + 24 = 59$.	

Subtract and test :

	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	44	38	56	64	49	65	45
	22	13	13	21	23	32	23
3.	58	65	68	57	69	86	77
	33	41	15	24	34	42	33
4.	77	88	75	96	87	94	52
	44	55	25	46	53	41	40
5.	67	59	88	97	76	85	34
	52	45	56	27	36	64	30
6.	99	96	87	79	98	77	59
	38	74	64	38	84	63	50

* To THE TEACHER. The first method (called the **addition method**) should be taught for *mental work*, since it is always used in making change. For *written work*, the teacher should select the method she prefers; but should under no circumstances teach both methods.

1. John helped a farmer 14 hours one week; Paul helped 12 hours less. How many hours did Paul work?

2. Ruth spent 30 cents for knitting needles. She gave the clerk 50 cents. How much change should she receive?

3. A boy sold 43 newspapers one day, and 67 the next day. How many more did he sell the second day than the first day?

4. After Paul had walked 24 miles, how many more miles did he have to go to complete 68 miles?

5. Frank raised 78 lettuce plants and John raised 56 plants. How many more plants did Frank raise than John?

6. Our class knitted 78 pairs of socks. 36 pairs were white and the rest were gray. How many pairs of gray socks were knitted?

7. Mr. Burton's farm contained 76 acres of land. He had 14 acres more than his neighbor. How many acres were there in his neighbor's farm?

8. James rode 27 miles on his bicycle one day and 14 miles the next day. How much farther did he ride the first day than the second?

9. Make problems about:

children	birds	games	dollars	cents
46 − 14	37 − 24	63 − 12	48 − 36	73 − 21
56 − 43	62 − 31	84 − 21	46 − 24	36 − 15

10. There were 34 children in Miss Bell's class. How many of them were absent, if only 22 were present?

1. From 80 subtract 27.

<div align="right">7 10</div>

80 = 8 tens + 0 ones, or	7 tens + 10 ones	8 0
27 =	2 tens + 7 ones	2 7
53 =	5 tens + 3 ones	5 3

As you cannot take 7 from 0, think of 80 as 70 + 10. Then subtract 7 ones from 10 ones and 2 tens from 7 tens.

FIRST METHOD *	SECOND METHOD *
Think:	Think:
Ones. 7 + 3 = 10. Write **3**.	*Ones.* 10 − 7 = **3**. Write **3**.
Tens. 2 + 5 = 7. Write **5**.	*Tens.* 7 − 2 = **5**. Write **5**.

Test. 53 + 27 = 80.

Subtract, and test each result:

	a	b	c	d	e	f	g
2.	40	60	20	30	50	70	90
	25	32	11	6	28	29	45
3.	30	40	80	70	50	60	80
	23	17	38	26	42	27	9
4.	90	70	80	60	40	20	50
	28	43	24	58	16	8	23

5. Father paid $18 deposit on a $50 coat. How much more must he pay?

6. George had 40¢ and paid 25¢ for a thrift stamp. How much had he left?

<div align="center">* See Note, page 88.</div>

1. From 83 subtract 35.

```
                                          7 13
83 = 8 tens + 3 ones, or 7 tens + 13 ones  8 3
35 =                     3 tens +  5 ones   3 5
48 =                     4 tens +  8 ones   4 8
```

FIRST METHOD	SECOND METHOD
Think :	Think :
Ones. 5 + **8** = 13. Write **8**.	*Ones.* 13 − 5 = **8**. Write **8**.
Tens. 3 + **4** = 7. Write **4**.	*Tens.* 7 − 3 = **4**. Write **4**.

Test.   48 + 35 = 83.

Subtract, and test each result :

	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	63	92	84	57	55	34	91
	27	69	39	38	19	17	54
3.	48	81	81	63	92	86	84
	29	27	29	44	74	58	45
4.	55	93	52	53	67	92	54
	26	75	27	49	49	46	38
5.	54	42	31	65	91	43	22
	36	28	25	58	78	38	13
6.	88	93	45	21	72	56	46
	59	86	37	16	25	39	27

7. Philip had 92¢ in his bank. He took out 57¢ to pay for a bat. How much had he left?

8. Mother made 45 jars of jelly. All but 26 jars were grape jelly. How many jars of grape jelly were there?

Subtract, and test each result:

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	37	46	52	45	50	75	55
	29	38	39	38	42	38	46
2.	47¢	90¢	67¢	91¢	63¢	91¢	82¢
	28¢	27¢	18¢	38¢	17¢	75¢	49¢
3.	57¢	45¢	23¢	54¢	46¢	72¢	50¢
	29¢	29¢	18¢	37¢	39¢	49¢	38¢
4.	47¢	33¢	71¢	66¢	43¢	66¢	60¢
	29¢	19¢	19¢	28¢	39¢	19¢	49¢

5. John bought a penknife at a sale, marked down from 80¢ to 38¢. How much did he save?

6. Mary picked 63 quarts of strawberries and donated 36 quarts to a Red Cross sale. How many quarts did she have left?

7. John sold 83 quarts of milk in May and 58 quarts in June. How many more quarts did he sell in May than in June?

8. In a school there were 32 girls and 19 boys. How many more girls than boys were there in the school?

9. John read 91 pages in his story book and Mary read 76 pages in hers. How many more pages did John read than Mary?

10. On flag day Susan counted 93 flags on one street and Ellen 49 flags on another street. How many more flags did Susan count than Ellen?

1. Mother paid 40¢ for a pound of butter, 32¢ for a pound of coffee, and 14¢ for a quart of milk. How much did she pay for the three articles?

2. How much money had she left from 90¢?

3. Find the total cost of a pair of socks for 98¢, a cap for 75¢, and a pair of gloves for 85¢.

4. Charles bought a dozen lemons for 35¢. How much change did he get from 50¢?

5. Katherine put the following coins into her bank: a dime, a cent, a nickel, a quarter, and a half dollar. How much money did she put into her bank?

6. Harold bought a paint box for 69¢ and a painting book for 12¢. What was the total cost?

7. John had a school garden. In the spring he paid 15¢ for seed. In the summer he sold radishes for which he received in all 92¢. How much did he make?

8. A man owed a bill of $45. He paid $27. How much then remained to be paid?

9. Lucy and Mary together earned 90¢ by weeding a vegetable garden. Mary earned 43¢. How much did Lucy earn?

10. Thomas bought a book for 80¢, and sold it for 55¢. How much did he lose?

11. Find the cost of a penknife for 50¢, a dozen pencils for 25¢, and a pencil sharpener for 8¢.

1. Divide 72 by 3.

3)72 $7 \div 3 = 2$ with 1 remaining. Write **2** under 7.
24   As the remainder is 1 *ten* add 10 to the next
figure, 2; $10 + 2 = 12$; $12 \div 3 = 4$. Write **4** under 2.

Think: *Tens.* 3 in 7, **2**, with 1 remaining. Write **2**.
    Ones. 3 in 12, **4**. Write **4**.

Test. $3 \times 24 = 72$, the dividend.

2. Divide 714 by 3.

    Think:

3)714   *Hundreds.* 3 in 7, **2**, with 1 remaining.
238   Write **2**.
    Tens. 3 in 11, **3**, with 2 remaining. Write **3**.
    Ones. 3 in 24, **8**. Write **8**.

Divide by 2 and test:

	a	b	c	d	e	
3.	34	90	472	700	364	**6.** 3)315
						105
4.	56	30	694	906	588	**7.** 4)416
5.	78	58	256	502	752	104

	a	b	c	d
8.	3)726	4)892	2)910	3)750
9.	3)384	4)916	2)538	4)900

10. $\frac{1}{3}$ of 510 men = ? $\frac{1}{3}$ of 171 balls = ? $\frac{1}{2}$ of 748 = ?

1. Walter had 48 baskets of fruit. He sold an equal number to each of 4 different buyers. How many baskets did each buy?

4)**48,** Number of baskets.
  12, Number of baskets to each.   ¼ of 48 baskets = 12 baskets.

2. Mary had 45 cents. How many 3 cent oranges could she buy with her money?

3 ¢)**45** ¢   3 ¢ = cost of 1 orange;
     15   45 ¢ ÷ 3 ¢ = 15, the number of oranges.

3. A man divided $375 equally among 3 charities. How much did each receive?

4. Mr. Bell earned $396 in 3 months. What were his monthly wages?

5. Find the cost of 1 bushel of wheat, if 4 bushels cost 800 cents.

6. If a girl sewed 4 buttons on each pair of gloves, how many pairs were finished when she had used 468 buttons?

7. A farmer having 96 hogs sold one third of them. How many did he sell?

8. In a car containing 639 baskets of peaches, one third were spoiled. How many baskets were spoiled?

9. How many pound boxes can be filled from 164 quarter pounds of tea?

10. When molding costs 15 ¢ a yard, how much will 1 foot of it cost?

1 ft. = ⅓ of a yard; 1 ft. will cost ⅓ of 15 ¢, or 5 ¢.

1. Show by adding five 2's that $5 \times 2 = 10$; show by adding five 3's that $5 \times 3 = 15$, and so on.

2. Count by 5's to 20; to 60.

3. Build the table of 5's as you built the table of 4's.

4. How many are 5×4? 4×5? 5×6? 6×5?

5. How many are 5×7? 7×5? 5×8? 8×5? 5×9? 9×5? 5×10? 10×5? 5×11? 11×5? 5×12? 12×5?
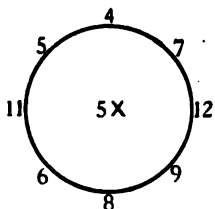
6. Multiply each of the outside numbers by 5. Change the number within the circle to 4 and multiply; then to 3; to 2.

7. Memorize this table:

$5 \times 1 = 5$	$5 \times 7 = 35$
$5 \times 2 = 10$	$5 \times 8 = 40$
$5 \times 3 = 15$	$5 \times 9 = 45$
$5 \times 4 = 20$	$5 \times 10 = 50$
$5 \times 5 = 25$	$5 \times 11 = 55$
$5 \times 6 = 30$	$5 \times 12 = 60$

8.
$2 \times 5 = ?$　　　　5 is ? of 10
$4 \times ? = 20$　　　? is $\frac{1}{5}$ of 20
$5 \times 5 = ?$　　　　25 is ? $\times 5$
$? \times 5 = 35$　　　? is $\frac{1}{5}$ of 35
$9 \times ? = 45$　　　$\frac{1}{5}$ of 45 is ?

9. Give the products:

8×5 boys; 9×5 birds; 5×5 cents; 12×5 girls.

10. Compare:

$3 \times \$5$ and $5 \times \$3$　　　　7×5 hats and 5×7 hats
$9 \times \$5$ and $5 \times \$9$　　　　12×5 pins and 5×12 pins

1. Count by 5's to 15; to 25; to 45; to 50; to 60.

2. $? \times 5 = 15$ $? \times 5 = 20$ $? \times 5 = 40$

3. Give the answers rapidly:

$5 \div 5$	$15 \div 5$	$50 \div 5$	$45 \div 5$
$30 \div 5$	$40 \div 5$	$35 \div 5$	$10 \div 5$
$55 \div 5$	$60 \div 5$	$25 \div 5$	$20 \div 5$

4. 5)525 ·   5)905   5)600   5)6005
         105   181   120   1201
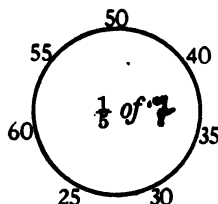
5. Divide 14 by 5:

5)14 $14 \div 5 = 2$, with a *remainder* of 4, since $2 \times 5 = 10$
  2 ; r. 4   and $14 - 10 = 4$.   Write the abbreviation r. for
              remainder.

Divide by 5 and give the remainders:

	a	b	c	d	e	f	g
6.	16	17	46	33	18	38	21
7.	32	26	37	27	34	36	41
8.	24	29	23	19	44	39	49

9. Find $\frac{1}{5}$ of: 420 men; 375 hr.; $415; 870¢.

Divide and test:

	a	b	c	d	e
10.	5)4225	5)7085	5)9275	5)4375	5)8450
11.	5)5690	5)4280	5)1365	5)7000	5)7005
12.	5)7025	5)9040	5)2750	5)4200	5)2005

1. Show by adding six 2's that $6 \times 2 = 12$; show by adding six 3's that $6 \times 3 = 18$; and so on.

2. Count by 6's to 12; to 24; to 48; to 60; to 72.

3. Build the table of 6's as you built the table of 5's.

4. Our flag has one star for each state. How many states are there? $6 \times 8 = ?$

5. Memorize this table:

$6 \times 1 = 6$	$6 \times 7 = 42$
$6 \times 2 = 12$	$6 \times 8 = 48$
$6 \times 3 = 18$	$6 \times 9 = 54$
$6 \times 4 = 24$	$6 \times 10 = 60$
$6 \times 5 = 30$	$6 \times 11 = 66$
$6 \times 6 = 36$	$6 \times 12 = 72$

6. Compare:

6×2 and 2×6 6×5 and 5×6
6×3 and 3×6 6×7 and 7×6
6×4 and 4×6 6×8 and 8×6

7. Multiply each number outside the circle by 3; by 4; by 5; by 6.
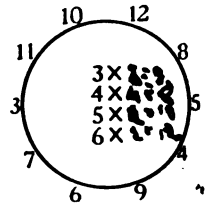
Multiply by 6; by 5; by 4; by 3:

	a	b	c	d	e
8.	243	567	149	759	894
9.	679	295	293	384	839
10.	978	869	687	825	856
11.	207	890	903	708	605

12. Give the products:

$6 \times \$40$	6×20¢	6×80 men	6×61 pens
$6 \times \$70$	6×35¢	6×32 boys	6×42 pads
$6 \times \$90$	6×41¢	6×71 girls	6×81 beads

1. How many times is 6 contained in 12? in 18? in 24? in 48? 60? 54? 36? 66? 42? 72?

2. Give the answers rapidly:

$42 \div 6$	$60 \div 6$	$36 \div 6$	$24 \div 6$	$48 \div 6$
$72 \div 6$	$66 \div 6$	$\frac{1}{6}$ of 48	$\frac{1}{6}$ of 42	$60 \div 6$
6)48	6)60	6)54	6)36	6)30

Divide each number by 6:

	a	b	c	d	e
3.	480	600	624	540	366
4.	720	618	246	726	612

Complete:

	a	b	c
5.	$15 \div 6 = \underline{}$ with $\underline{}$ r.	$2 \times 6, + ? = 15$	$? \times 6, + 3 = 15$
6.	$45 \div 6 = \underline{}$ with $\underline{}$ r.	$? \times 6, + 3 = 45$	$6 \times ?, + 3 = 45$

Divide by 6 and test:

	a	b	c	d	e
7.	846	864	630	7242	8694
8.	672	294	840	7608	3252

9. Compare in two ways: $18 and $6; $36 and $6; 42 books and 6 books; 24 hats and 6 hats.

10. There are 96 men marching in 6 equal rows. How many men are there in each row?

11. How many boxes are needed for 108 eggs, if each box holds half a dozen?

Time yourself in these exercises. Then work them again and try to make better speed.

Multiply each number by 2; by 3; by 4; by 5:

	a	b	c	d	e	f
1.	468	456	273	332	634	804
2.	684	654	372	233	436	972
3.	236	564	732	548	364	729
4.	632	542	412	485	184	908

Multiply each number by 6; by 5; by 4; by 3:

	a	b	c	d	e	f
5.	426	848	408	798	249	284
6.	264	844	840	897	942	428
7.	624	853	480	789	429	842
8.	165	790	981	679	257	912

Divide by 3; by 6:

	a	b	c	d
9.	1812	4068	1800	1896
10.	1206	4734	1752	2868
11.	1404	1626	2592	3360
12.	2070	1920	1422	1224
13.	2736	1308	1392	1314

Divide by 5:

	a	b	c	d
14.	1725	1600	2800	2050
15.	2280	1090	2390	1095
16.	2835	2030	1580	3185
17.	3390	1500	1400	4560
18.	3945	1625	2325	5615

1. A rug was reduced from $98 to $69. How much was it reduced?

2. Mother paid $27 for Jean's coat and $28 for Helen's. How much did she pay for both?

3. A farmer bought 5 horses at $225 each. How much did they all cost?

4. There were 52 pupils in the third grade and 39 pupils in the fourth grade. How many more were there in the third grade than in the fourth grade?

5. If 6 coats of the same kind cost $120, what was the price of each?

6. How many tablecloths at $5 each could be bought for $100?

7. Uncle had 720 foreign stamps, which he divided equally among 6 nephews. How many did each get?

8. There were 85 boys at a football game. How many were left when 28 boys went home?

9. Ruth had 96¢. She deposited 48¢ in the school savings bank. How much had she left?

10. There were 26 passengers on one side of the car and 18 passengers on the other side. How many people were in the car?

11. The children printed 60 tickets for a fair. When there were only 28 left how many had been sold?

12. At 5¢ a day, how long did it take Arthur to save enough money to buy a copy of "Robinson Crusoe" costing 80¢?

2 pints = 1 quart	2 pt. = 1 qt.
8 quarts = 1 peck	8 qt. = 1 pk.
4 pecks = 1 bushel	4 pk. = 1 bu.
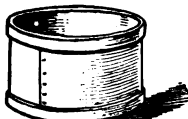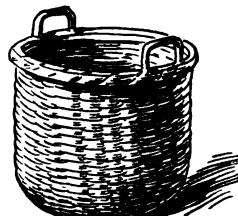
PINT   QUART   PECK   BUSHEL

1. Name some dry articles purchased by the pint; by the quart; by the peck; by the bushel.

2. Secure some sand or grain, and show by actual measurements the number of pints in a quart; quarts in a peck; pecks in a bushel.

3. Memorize the table.

4. 1 bushel = —— pecks; 1 peck = —— quarts.

5. How many quarts equal 1 bushel?

6. $\frac{1}{4}$ peck = —— quarts; $\frac{1}{2}$ peck = —— quarts.

7. At 8¢ a pint, find the cost of 1 quart of nuts.

8. A horse eats 12 quarts of oats a day. How many quarts does he eat in 4 days?

9. $2\frac{1}{2}$ pecks = —— quarts; 16 quarts = —— pecks.

10. James bought $1\frac{1}{2}$ bushels of tomatoes. How many pecks did he buy?

11. Elizabeth bought $\frac{1}{2}$ peck of peas. How many quarts did she get?

1. Name some liquids sold by the pint; by the quart; by the gallon.

2. Memorize this table:

2 pints = 1 quart	2 pt. = 1 qt.
4 quarts = 1 gallon	4 qt. = 1 gal.

3. 2 gallons = how many quarts?

4. From a gallon of milk how many quarts can be sold? how many pints?

5. Mrs. Adams buys 2 quarts of milk a day. How many quarts does she buy in 20 days? how many gallons?

6. At 14¢ a quart, how much does the milk cost her per week?

7. From a jug containing 3 gallons of vinegar, how many quarts can be sold?

8. How many pints are there in 12 quarts? how many gallons?

Copy these problems and insert the answers in the blank spaces:

9. 1 qt. = —— pt.   14. 4 gal. = —— qt.

10. 8 qt. = —— gal.   15. 24 qt. = —— gal.

11. 16 pt. = —— qt.   16. 6 pt. = —— qt.

12. 8 gal. = —— qt.   17. 4 qt. = —— gal.

13. 8 pt. = —— qt.   18. 5 gal. = —— qt.

1. Tell how the following articles are sold : butter, sugar, meat, cheese, tea.

The smallest weight in the picture is called **an ounce weight**. The largest weight is a sixteen-ounce weight, and is called a **pound weight**.

The other weights are half-pound weights, quarter-pound weights, etc.

Any article that the pound weight balances weighs just **one pound**.

Use real scales or make a balance and weigh various articles.

---

16 ounces = 1 pound   16 oz. = 1 lb.

---

2. Helen's purchase at the store weighs 8 oz.   What part of a pound does it weigh ?

3. 6 oz. + 4 oz. + 6 oz. = ___ oz. = ___ lb.

4. 10 oz. + 12 oz. + 10 oz. = ___ oz. = ___ lb.

5. ¼ lb. = ___ oz.   ½ lb. = ___ oz.

6. How many 2-ounce packages weigh 1 pound ?

1. Ask the grocer or your parents what small articles are sold by the ounce or by the pound.

2. What weights are used by the butcher?

3. Edith bought a 2-ounce package of onion seeds, a 4-ounce package of lettuce seeds, an 8-ounce package of tomato seeds, and a 2-ounce package of flower seeds. How many pounds did she buy in all?

4. Find the cost of 2 lb. of fish at 28¢ a pound.

Copy and fill out:

5. 16 oz. = ——— lb.   11. $\frac{1}{4}$ lb. = ——— oz.

6. 1 lb. = ——— oz.   12. 8 × 2 oz. = ——— oz.

7. $\frac{1}{2}$ lb. = ——— oz.   13. 8 × 2 oz. = ——— lb.

8. 8 oz. = ——— lb.   14. 20 oz. = 1 lb. and ——— oz.

9. 4 oz. = ——— lb.   15. 4 × 4 oz. = ——— oz.

10. 2 lb. = ——— oz.   16. 4 × 4 oz. = ——— lb.

17. How many ounces are there in $\frac{1}{2}$ pound of sugar?

18. How much must I pay for a chicken weighing 3 lb. at 44¢ a pound?

19. How many ounces of ginger are equal to 6 pounds of ginger?

20. Ruth's mother buys $\frac{1}{4}$ of a pound of knitting wool. How many ounces should she get? How many ounces should she get if she buys $1\frac{1}{2}$ pounds?

21. Find the cost of $\frac{1}{4}$ lb. of butter at 36¢ a pound.

1. Measure the width of a table in feet and inches.

2. $\frac{1}{4}$ foot = —— inches ; $\frac{1}{3}$ foot = —— inches.

3. Some articles are sold by a measure 3 times the length of a foot rule. Name some of them.

4. Draw a line on the blackboard 3 feet in length.

5. The line you have drawn is **one yard** long.

> **3 feet = 1 yard   3 ft. = 1 yd.**

6. A piece of cloth is 6 yards long. How many feet is it in length?

Copy and fill in the blanks :

7. 3 ft. = —— in.

8. 3 ft. = —— yd.

9. 2 ft. = —— in.

10. 12 in. = —— ft.

11. 18 ft. = —— yd.

12. 5 ft. = —— in.

13. 4 ft. = —— in.

14. $\frac{1}{2}$ ft. = —— in.

15. $\frac{1}{3}$ yd. = —— ft.

16. 15 ft. = —— yd.

17. 7 yd. = —— ft.

18. 6 ft. = —— in.

Change :

19. $\frac{1}{4}$ ft. to inches.

20. $\frac{1}{3}$ ft. to inches.

21. 4 yd. to feet.

22. 8 yd. to feet.

23. 27 ft. to yards.

24. 24 ft. to yards.

25. 21 ft. to yards.

26. 12 ft. to yards.

27. 24 yd. to feet.

28. 48 yd. to feet.

29. 36 yd. to feet.

30. 5 yd. to feet.

1. Frank has a row of potatoes in his garden 150 ft. long. How many yards long is it?

2. Susan lives 360 yd. from the schoolhouse. How many feet does she live from the schoolhouse?

3. A steamship that is 960 ft. in length is how many yards long?

4. A man who is 6 ft. in height is how many inches in height? how many yards?

5. The schoolroom is 40 ft. in length. How many yards and feet over is that?

6. The schoolroom is 30 ft. in width. How many yards wide is it?

7. John is 5 ft. 4 in. in height. How many inches is he in height? Show this by the tapeline.

8. Mary sits 5 ft. from the teacher's desk. How many inches does she sit from the teacher's desk?

9. The schoolroom door is 3 ft. 9 in. wide. How many inches wide is the door?

10. Paul measures the distance that he lives from the schoolhouse and finds that it is 900 feet. How many yards is this distance?

11. Two girls measure with a tapeline the distance around the schoolhouse, and find that it is 140 ft. How many yards and how many feet over is this distance?

12. Mary is 4 ft. 7 in. tall. How many inches in height is she?

One inch	One inch	One inch
One square inch	One square inch	One square inch
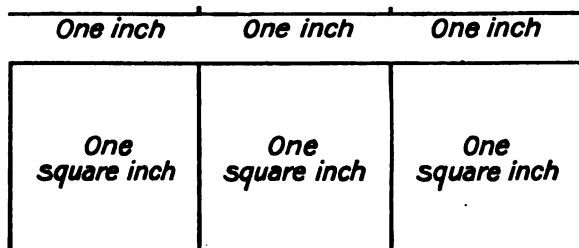
1. Measure this figure with your rule. How long is it? how wide? How many *equal sides* has it?

2. What is a square inch? How does the entire figure differ from one square inch?

A figure having square corners and longer than it is wide is called an **oblong**.

3. Cut from paper an oblong 1 inch wide and 4 inches long, and fold it to show the number of square inches in it. Do the same with an oblong 2 inches wide and 4 inches long.

4. An oblong is 5 inches long and contains 15 square inches. Draw the oblong to show the width and the number of square inches.

5. An oblong has 24 square inches. It is 6 inches long. Draw the figure on paper. Fold it to show each square inch.

6. An oblong 6 inches long and 3 inches wide will make an oblong —— inches long and 1 inch wide.

7. Show that a square containing 9 square inches is 3 inches on each side.

1. Draw a square 1 inch long and 1 inch wide. Call it a **square inch.**

2. Draw on the blackboard a square 1 foot long and 1 foot wide. Call it a **square foot.**

3. Draw on the blackboard a square 1 yard long and 1 yard wide. Call it a **square yard**.

4. Separate, by points, each side of the square yard into 3 equal parts. Connect these points by straight lines. What is the size of each square? How many square feet are there in a square yard?
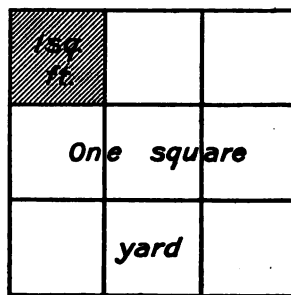
5. This picture shows a square yard, smaller than it really is. How many square feet does it show?

| 9 square feet = 1 square yard   9 sq. ft. = 1 sq. yd. |

6. Measure your desk. Decide on a convenient scale and draw a figure to represent the top of your desk.

7. Let $\frac{1}{4}$ inch stand for 1 foot, and draw an oblong to represent the floor of a room 20 feet long and 16 feet wide.

8. Decide on a convenient scale and draw an oblong to represent a flower bed 10 feet long and 5 feet wide.

1. Draw an oblong 6 inches long and 4 inches wide. Divide it into square inches. How many square inches are there in one row? How many rows are there? How many square inches are there in the entire oblong?

$$4 \times 6 \text{ sq. in.} = 24 \text{ sq. in.}$$

2. Draw another oblong 3 inches long and 2 inches wide, and find, in the same way, how many square inches it contains.

3. Draw an oblong 5 inches long and 4 inches wide and find, in the same way, how many square inches it contains.

Notice that the number of square inches equals the product of the number of inches in the length by the number of inches in the width.

4. Find the number of square feet in the floor of your classroom.

5. How many square inches are there in a four-inch square? Illustrate.

6. How many square inches can you cut from a piece of paper 4 inches long and 4 inches wide?

7. Draw two cards each containing 12 square inches.

8. A garden bed is 6 feet long and 10 feet wide. How many square feet does it contain?

9. How many square inches are there in a scarf 50 in. long and 6 in. wide?

1. How many pounds of sugar are there in 6 bags of 25 lb. each?

2. There are 248 pages in a book. When 89 pages are read, how many pages remain unread?

3. A barrel of flour weighs 196 pounds. How much is left after 68 pounds have been used?

4. There are 32 quarts in a bushel. How many quarts equal 5 bushels?

5. There are 9 school months in a year. How many school months are there in 6 years?

6. How many dollars are there in a purse containing 3 dollars, 2 quarters, 3 dimes, and 4 nickels?

7. A horse goes 36 miles in 6 hours; a bicycle goes the same distance in 4 hours. Find the speed per hour of each.

8. There are 181 pupils on the second floor of a school building and 157 pupils on the third floor. How many pupils are there on both floors? How many more are on the second floor than on the third floor?

9. A bushel of shelled corn weighs 56 pounds. How many pounds are there in 6 bushels?

10. There are 144 pens in a gross. How many are there in 5 gross?

11. There are 24 sheets of paper in a quire. How many sheets are there in 6 quires?

12. How much do 6 pounds of prunes cost at 9 cents a pound?

1. Read the numbers on the face of the clock.   Tell the time.

2. Observe the small spaces on the outer edge of the face.   These are called **minute** spaces.
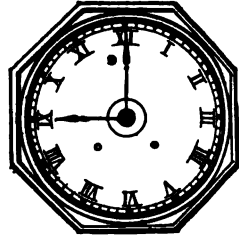
3. Over how many of these spaces does the minute hand move in passing around the face from XII to XII again?

4. How long is the minute hand in passing from XII to I ? the hour hand ?

5. Helen began studying at 15 minutes past 4 o'clock. She stopped at 20 minutes past 5.   How long did she study ?

6. Arthur played tennis from 2 o'clock on Saturday until half past 5.   How long did he play?

7. How many minutes are there in 1 hr. ? in 2 hr.? in 4 hr. ? in $\frac{1}{2}$ hr.?

8. When the hour hand is at XII, what is the time if the minute hand points to V? to III? to I ?

9. Count the hours on the clock face from 9 o'clock, the opening of school, until 9 o'clock the next morning.   How many are there?   These 24 hours include both day time and night time.

| 60 minutes = 1 hour | 60 min. = 1 hr. |
| 24 hours   = 1 day | 24 hr. = 1 da. |

The day always begins at 12 o'clock, **midnight.** The time from midnight to noon is called **forenoon.** The time from 12, noon, to midnight is called **afternoon.**

We write **A.M.** for *forenoon* and **P.M.** for *afternoon.* 8.20 A.M. is read 20 minutes past eight in the morning.

1. Read 6.10 A.M.; 4.25 A.M.; 6.30 P.M.; 10.00 P.M.

2. How many hours is it from 9 A.M. to 5 P.M.? from 10 P.M. to 6 A.M.?

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7 days = 1 week     7 da. = 1 wk.
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JULY

SUN	MON	TUE	WED	THU	FRI	SAT
··	··	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	··	··

3. Make a calendar for August similar to the one for July, beginning with Friday, Aug. 1.

4. Name the months of the year, beginning with January.

```
12 months = 1 year    12 mo. = 1 yr.
52 weeks  = 1 year    52 wk. = 1 yr.
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5. How many months are there in 5 years?

6. How many weeks are there in 3 years? in 6 years?

7. How many days are there in 6 weeks?

8. How many hours are there in 6 days?

9. How many minutes are there in 4 hours?

10. Give the dates of four important holidays.

1. Show by adding seven 2's that $7 \times 2 = 14$; show by adding seven 3's that $7 \times 3 = 21$; and so on.

2. Count by 7's to 21; to 42; to 63; to 84.

3. Build the table of 7's.

4. 2×7 days = ? 12×7 books = ?

5. Compare in value 5×7 and 7×5; 3×7 and 7×3; 7×6 and 6×7; 7×2 and 2×7; 4×7 and 7×4.

6. Memorize this table:
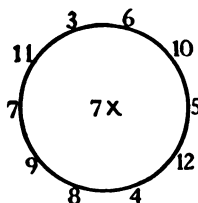
$7 \times 1 = 7$	$7 \times 7 = 49$
$7 \times 2 = 14$	$7 \times 8 = 56$
$7 \times 3 = 21$	$7 \times 9 = 63$
$7 \times 4 = 28$	$7 \times 10 = 70$
$7 \times 5 = 35$	$7 \times 11 = 77$
$7 \times 6 = 42$	$7 \times 12 = 84$

7. What multiplicand and multiplier make:

49	12	36	28	24
35	30	14	18	14
63	42	84	77	21

Multiply:

	a	b	c	d	e
8.	456	265	157	963	904
	7	7	7	7	7
9.	7739	8497	6198	5424	6339
	7	7	7	7	7

Multiply by 7, testing answers:

7528	6934	8576	7935
5697	2469	3875	8094

1. How many times is 7 contained in 14? in 21? 42? 63? 28? 35? 49? 70? 77? 56?

2. Find $\frac{1}{7}$ of 84; 63; 42; 35; 56; 70; 14; 21.

Find the quotients and the remainders:

a	b	c	d	e	f
3. 7)42	7)63	7)56	7)49	7)84	7)35
4. 7)72	7)52	7)48	7)33	7)46	7)80

Divide by 7:

5. 84	56	59	68	45	36
6. 217	364	427	637	273	696

Divide and test:

a	b	c	d	e
7. 7)2436	6)7392	7)8694	6)7854	7)4697
8. 5)2605	7)8050	6)3078	7)2093	5)8090
9. 7)7385	6)2862	7)2534	5)3205	7)6972

10. How many 7-pound bags can be filled from 259 pounds of sugar?

11. How many weeks are there in 49 days?

12. How many suits, each requiring 7 yards, can be made from a piece of cloth containing 84 yards?

13. How many 7¢ packages of crackers can be bought

1. Show by adding eight 2's that $8 \times 2 = 16$; show by adding eight 3's that $8 \times 3 = 24$, and so on.

2. Count by 8's to 24; to 64; to 96.

3. Build the table of 8's.

4. How many are 2×8 balls? 3×8 books? 4×8 boys? 5×8 pens? 6×8 apples?

5. Give quickly:

6×8	8×6	7×8	5×8
8×4	8×10	8×2	8×11
8×12	4×8	8×8	8×5
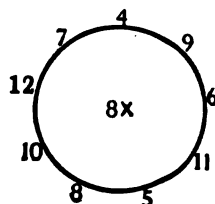
6. Memorize this table:

$8 \times 1 = 8$	$8 \times 7 = 56$
$8 \times 2 = 16$	$8 \times 8 = 64$
$8 \times 3 = 24$	$8 \times 9 = 72$
$8 \times 4 = 32$	$8 \times 10 = 80$
$8 \times 5 = 40$	$8 \times 11 = 88$
$8 \times 6 = 48$	$8 \times 12 = 96$

7. Give answers:

$? \times 8 = 32$	$7 \times ? = 56$
$6 \times ? = 48$	$? \times 5 = 40$
$? \times 8 = 72$	$8 \times ? = 64$
$10 \times ? = 80$	$? \times 3 = 27$
$12 \times ? = 84$	$2 \times ? = 18$

Multiply by 8:

	a	b	c	d	e
8.	6230	5178	8629	9310	7865
9.	2937	8694	9083	8697	7289
10.	9048	6937	2865	4705	8136

Give the products rapidly:

11.	8×50	8×70	8×91	8×12	8×31
12.	7×40	7×60	7×71	8×11	7×20
13.	8×90	7×81	8×30	7×21	8×61

1. $8 \times 2 = ?$ $16 \div 8 = ?$ $8 \times 3 = ?$ $24 \div 8 = ?$

2. $8 \times 4 = ?$ $32 \div 8 = ?$ $8 \times 5 = ?$ $40 \div 8 = ?$

3. $48 \div 8 = ?$ $56 \div 8 = ?$ $64 \div 8 = ?$ $72 \div 8 = ?$ $96 \div 8 = ?$

4. 64 contains 8——times. 72 contains 8——times.

5. 58 contains 8——times, with —— remainder.

6. 83 contains 8——times, with —— remainder.

Give the quotients and the remainders :

	a	b	c	d	e
7.	8)64	8)32	8)40	8)72	8)56
8.	8)16	7)56	8)24	6)48	8)48
9.	4)35	8)89	5)44	8)98	8)93

Find :

10. $\frac{1}{8}$ of 24 $\frac{1}{8}$ of 96 $\frac{1}{8}$ of 88 $\frac{1}{8}$ of 80 $\frac{1}{8}$ of 48

11. $\frac{1}{8}$ of 640 $\frac{1}{8}$ of 720 $\frac{1}{8}$ of 400 $\frac{1}{8}$ of 320 $\frac{1}{8}$ of 800

Divide by 8 :

	a	b	c	d	e
12.	176	824	624	472	608
13.	8072	2096	3072	4088	6024
14.	2904	8104	2992	7904	8600

15. How many tablets, at 8¢ each, can be bought for 72¢?

16. John collected 240¢ in equal amounts from 8 children for a charitable fund. How much did each give ?

1. Show by adding nine 2's that $9 \times 2 = 18$; show by adding nine 3's that $9 \times 3 = 27$, and so on.

2. Count by 9's to 27; to 54; to 108.

3. Build the table of 9's.

4. Compare 6×9 and 9×6; 8×9 and 9×8.

5. Multiply by 9:

40   60   80   20   50   10   30   70   90   31   51   71

6. Memorize this table:

$9 \times 1 =\ \ 9$	$9 \times\ \ 7 =\ \ 63$
$9 \times 2 = 18$	$9 \times\ \ 8 =\ \ 72$
$9 \times 3 = 27$	$9 \times\ \ 9 =\ \ 81$
$9 \times 4 = 36$	$9 \times 10 =\ \ 90$
$9 \times 5 = 45$	$9 \times 11 =\ \ 99$
$9 \times 6 = 54$	$9 \times 12 = 108$
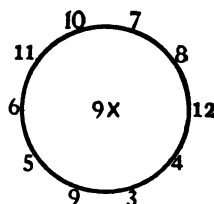
Give two numbers that form each of these products:

7. 21,   36,   44,   48,   50,   40,   54,   45,   33,   27

8. 88,   90,   60,   77,   81,   63,   66,   72,   56,   80

Multiply by 9:

	a	b	c	d	e
9.	4693	7286	4615	8738	6967
10.	4135	2874	6398	1869	7043
11.	8286	3697	4589	2893	9097
12.	9387	2945	9304	6356	2864
13.	6005	7894	9999	6090	7500

Multiply by 9 :

	a	b	c	d	e
1.	4226	8393	3786	2468	8321
2.	5483	6692	2294	8329	6245
3.	6396	2594	4968	5692	9374
4.	7278	7246	5328	7386	8928
5.	6304	5008	7090	8540	6384
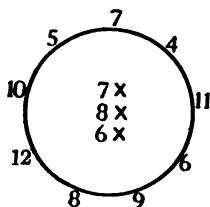
Find the products :

6. 9×38 gal. 9×24 da. 9×16 min.

7. 9×17 bu. 9×29 mo. $9 \times 25¢$

8. Find products first by 7, then by 8, then by 6, of each number outside the circle.

9. State the products rapidly. Memorize any combinations that trouble you.

4	9	9	7	11	6	9	10	11
4	4	5	9	8	8	7	5	5
8	7	8	7	6	7	8	10	11
5	7	4	4	9	6	7	8	7
12	7	11	10	6	7	6	8	8
6	8	6	7	5	5	6	9	8
9	12	8	10	9	12	12	12	12
9	5	6	6	8	4	9	3	7

1. How many tables, at $9 each, can be bought for $18? for $27? for $36? for $45? for $54? for $63?

2. Give the quotients and the remainders:

63 ÷ 9	81 ÷ 9	45 ÷ 5	36 ÷ 4	18 ÷ 9
75 ÷ 9	64 ÷ 9	83 ÷ 9	95 ÷ 9	97 ÷ 9
$\frac{1}{9}$ of 36	$\frac{1}{9}$ of 99	$\frac{1}{9}$ of 54	$\frac{1}{9}$ of 90	$\frac{1}{9}$ of 72
$\frac{1}{9}$ of 27	$\frac{1}{9}$ of 45	$\frac{1}{9}$ of 81	$\frac{1}{9}$ of 63	$\frac{1}{9}$ of 108

3. Tell which is greater and how much:

$\frac{1}{9}$ of 81 or $\frac{1}{3}$ of 30 $\frac{1}{8}$ of 40 or $\frac{1}{9}$ of 45

$\frac{1}{8}$ of 64 or $\frac{1}{9}$ of 63 $\frac{1}{7}$ of 63 or $\frac{1}{9}$ of 81

Divide by 9:

	a	*b*	*c*	*d*	*e*
4.	2637	1856	2934	7686	8172
5.	6381	2097	3087	6075	7236
6.	8469	3762	2988	2205	3609
7.	7587	6291	8694	2486	6093

8. Give the quotients rapidly:

180 ÷ 9	360 ÷ 9	900 ÷ 9	720 ÷ 9	729 ÷ 9
279 ÷ 9	549 ÷ 9	459 ÷ 9	639 ÷ 9	450 ÷ 9

9. If a postman delivers 954 letters in 9 hours, how many letters does he average in one hour?

10. How many times can 9 inches be marked off from a line 3 feet in length?

11. At 3 melons for 15 cents, how many melons can be bought for 45 cents?

1. There are 8 pints in one gallon. How many pints are there in 32 gallons?

2. A train runs 26 miles in 1 hour. How far can it run in 9 hours?

3. How much will 8 yards of lawn cost at 32 cents a yard?

4. There are 9 boys in a baseball team. How many teams can be formed with 36 boys?

5. At 9 cents a pound, how many pounds of sugar can be bought for 153 cents?

6. There are 168 cabbage plants in 8 rows. How many are there in each row?

7. How many bushels equal 396 pecks?

8. How many gallons equal 396 quarts?

9. How many weeks equal 287 days?

10. If 8 hours is a day's work, for how many days should a man be paid who has worked 304 hours?

11. 6 melons cost 78 cents. How much is that apiece?

12. How many yards equal 54 feet?

13. At 96 cents a gallon, what is the cost of a pint of molasses?

14. Seven o'clock A.M. is how many hours after midnight?

15. 144 square inches equal one square foot. How many square inches equal 8 square feet?

Robert's School Garden
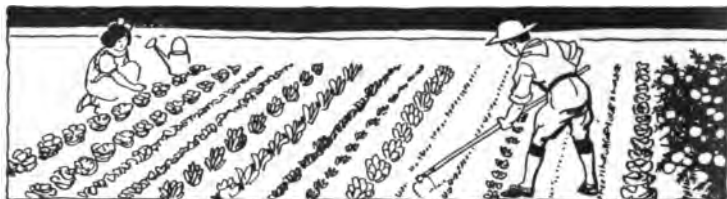
1. Robert had a plot in a school garden 10 feet long and 8 feet wide. How many square feet were there in his plot?

2. He planted a row of tomatoes from which he raised 96 pounds. How much did he get for them at 9 ¢ a pound?

3. He planted two rows of beans which he thinned out to 3 plants to the foot. How many plants did he then have on the 20 feet?

4. How much did he get for 15 pounds of beans at 8 ¢ a pound?

5. He planted 35 turnips 7 to the foot. How many feet of turnips did he plant?

6. He raised 28 pounds of turnips which he sold at 3 ¢ a pound. How much did he get for them?

7. He also planted beets, carrots, and Swiss chard. He received 30 ¢ for his beets, 20 ¢ for his carrots, and 25 ¢ for his chard. How much did he get for these vegetables?

8. He raised and sold 10 heads of lettuce at 5 ¢ apiece and 8 bunches of radishes at 5 ¢ a bunch. How much did he get for them?

Answer quickly:

	a	*b*	*c*	*d*	*e*
1.	6×3	5×4	$10 - 2$	4×5	$\frac{1}{3}$ of 24
2.	7×10	6×6	$18 - 6$	4×3	$64 \div 8$
3.	9×2	8×10	$40 - 10$	4×4	$\frac{1}{6}$ of 48
4.	7×3	6×5	$\frac{1}{7}$ of 42	9×3	7×8
5.	4×7	10×9	$90 \div 9$	5×5	7×4
6.	$20 - 4$	$\frac{1}{4}$ of 28	8×3	$16 - 10$	$49 \div 7$
7.	$22 - 7$	$\frac{1}{5}$ of 20	7×6	$\frac{1}{2}$ of 24	$\frac{1}{3}$ of 36
8.	6×4	$31 - 6$	$\frac{1}{3}$ of 27	8×7	5×8
9.	4×9	3×10	$54 - 6$	9×6	$28 \div 4$
10.	5×2	$\frac{1}{5}$ of 25	9×9	$32 \div 8$	$\frac{1}{6}$ of 30
11.	8×6	$48 \div 8$	7×9	$\frac{1}{5}$ of 35	6×10
12.	8×5	4×8	$\frac{1}{3}$ of 18	$32 \div 4$	3×3
13.	3×6	$56 \div 8$	$\frac{1}{6}$ of 72	8×8	9×7
14.	$54 - 6$	$72 \div 8$	$\frac{1}{4}$ of 48	5×9	8×9
15.	$39 - 7$	9×8	$47 - 8$	$\frac{1}{4}$ of 44	$\frac{1}{6}$ of 66
16.	$\frac{1}{9}$ of 63	$72 - 9$	$81 \div 9$	$\frac{1}{5}$ of 40	$\frac{1}{6}$ of 42
17.	$\frac{1}{3}$ of 30	$83 - 9$	7×7	$\frac{1}{2}$ of 18	$\frac{1}{4}$ of 36
18.	9×12	9×9	8×7	$35 \div 5$	$56 \div 7$
19.	6×7	9×5	$\frac{1}{5}$ of 30	6×11	8×11
20.	9×10	7×12	$84 \div 7$	7×11	$44 \div 11$

Find how long it takes you to get the *right answers* to each set of five examples.

I

1. $9 \times 8 = ?$ $7 \times 6 = ?$

2. 64 qt. = —— pk.
   3 bu. = —— pk.

3. $7854 \div 7 = ?$
   $9864 \div 9 = ?$

4. Make a diagram on a scale of $\frac{1}{12}$ to show a rug 3 ft. by 5 ft.

5. $6 + 7 + 9 + 0 + 4 = ?$

II

1. $1 + 2 + 3 + 4 + 5 + 6$
   $+ 7 + 8 + 9 = ?$

2. $84 - 7 = ?$ $79 - 8 = ?$
   $57 - 9 = ?$ $91 - 7 = ?$

3. Give the sums :

9	7	5	15	13	7	5
8	6	8	7	4	9	9

4. $56371 \div 7 = ?$

5. $7209 \div 9 = ?$

III

1. Add $99, $40, $62.

2. 8 pk. = —— qt.

3. Add :

9	7	5	8	5
3	8	6	9	4
4	9	7	8	7
5	7	1	7	9
6	6	9	6	3
7	5	7	5	4

4. 2 hr. = —— min.
   3 da. = —— hr.

IV

1. How many pints of milk are used in 30 days if 1 qt. and 1 pt. are used each day ?

2. How many ounce packages can be made from 9 lb. of cabbage seed ?

3. $5982 \div 6 = ?$

4. $302 - 189 = ?$

5. $9 \times 309 = ?$ $7 \times 694 = ?$

CHAPTER V

1. The ten-thousands are written 10,000; 20,000; 30,000; 40,000; 50,000; 60,000; 70,000; 80,000; 90,000.

For convenience in reading numbers of more than four figures, the figures are often separated by commas into groups of three figures each, beginning at the right. These groups are called **periods.**

The first period, counting from the right, is **units,** the second, **thousands.**

The following table shows the arrangement of these periods, and the three orders of figures in each period:

THOUSANDS' PERIOD			UNITS' PERIOD		
Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Ones
6	4	1,	3	7	6

The number in the table is read *641 thousand 376.*

2. Read: During the holidays the post office received for mailing 30,956 parcels, 229,875 postal cards, and 116,083 letters.

1. Read : In one year the canning clubs in several states canned 277,826 quarts of fruit, 22,180 quarts of corn, 50,158 quarts of beans, 170,606 quarts of tomatoes, 35,185 quarts of other vegetables, and 6249 quarts of meat.

2. Read : During 1918 our army consumed $573,123 worth of chocolate and $356,970 worth of molasses.

Copy, point off, and read :

3. 19000	40084	625476	900053
4. 20135	56506	308390	702401
5. 81125	70009	520067	601500
6. 73241	80808	786500	350000

Express in figures :

7. Forty-two thousand.

8. Sixty-six thousand four.

9. Seventy-five thousand fifty.

10. Thirty-nine thousand one hundred twenty-two.

11. Two hundred ten thousand three hundred fifty.

12. Five hundred sixty-five thousand one hundred.

13. One hundred twenty-five thousand.

14. Six hundred thousand thirty-five.

15. Nine thousand twenty-six.

16. Five hundred ninety thousand eighty.

17. Nine hundred ninety-nine thousand nine hundred ninety-nine.

Measuring Heat

We measure heat by a thermometer. The lines on a thermometer mark the degrees of heat.

1. Notice that there are 5 spaces on this thermometer for every 10 degrees. How many degrees are represented by each space?

2. What temperature is shown on this thermometer?

3. The freezing point of water is 32 degrees (written **32°**) and the boiling point 212°. How many degrees are there between these two points?

4. If the water in a kettle is at 78°, how many degrees must the temperature rise before the water will boil?

5. The proper temperature of a room is 68°. How much more heat is needed if the thermometer in a room shows 59°?

6. How many degrees too warm is a room if the thermometer shows 72°?

7. When Ruth was ill her temperature rose from 98° to 103°. How many degrees did it rise?

8. How many degrees does the temperature fall during a day when it is 82° in the morning and 30° at night?

9. How many degrees does the temperature rise from 63° in the morning to 80° in the afternoon?

10. How far above the freezing point is 70°?
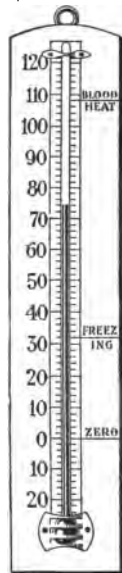
1. Add 234, 359, and 266.

Think:

<div style="float:left">
234
359
<u>266</u>
859
</div>

Ones. 6, 15, 19. Write **9**. Carry 1 to tens'
column.

Tens. 1, 7, 12, 15. Write **5**. Carry 1 to
hundreds' column.

Hundreds. 1, 3, 6, 8. Write **8**.

Test by adding downwards.

Write from dictation; then add and test:

	a	b	c	d	e	f
2.	234	230	101	231	301	243
	326	325	304	405	226	206
	434	265	376	568	304	306
3.	405	304	604	400	291	905
	304	349	787	697	743	634
	296	200	342	345	456	393
4.	623	344	23	509	20	502
	5	593	906	5	102	205
	340	25	25	820	67	50
5.	708	931	68	7	423	791
	55	67	834	751	92	8
	634	8	436	543	899	958
6.	589	389	543	135	246	798
	673	472	619	697	908	789
	458	564	789	804	753	698

1. Find the sum of 2430, 4307, and 68.

Think :

Ones. 8, 15.   Write **5**.   Carry 1 to tens'

2430
4307   column.
  68   *Tens.* 7, 10.   Write **0**.   Carry 1 to hun-
6805   dreds' column.

Hundreds.   1, 4, 8.   Write **8**.

Thousands.   4, 6.   Write **6**.

Write from dictation ; then add and test :

	a	b	c	d	e
2.	23	378	298	1008	603
	604	49	342	49	2798
	3068	3067	6781	706	6987
3.	1304	2004	4987	3740	6425
	279	3050	9	609	4020
	6000	50	807	4203	205
	200	674	5002	6001	1347

4. Add the examples on page 54.

Addition by Endings

Give sums from left to right :

5. $16 + 9$ $26 + 9$ $46 + 9$ $66 + 9$ $76 + 9$

6. $17 + 5$ $37 + 5$ $47 + 5$ $67 + 5$ $87 + 5$

7. $8 + 6$ $18 + 6$ $28 + 6$ $38 + 6$ $68 + 6$

8. $19 + 5$ $39 + 5$ $99 + 5$ $79 + 5$ $69 + 5$

Add and test:

	a	*b*	*c*	*d*	*e*	*f*
1.	3	4	2	2	5	6
	5	2	1	3	7	5
	4	7	5	4	9	9
	6	3	4	5	3	8
	2	4	1	6	1	7
	6	4	8	7	6	4
	5	5	2	8	8	3
	4	3	5	9	4	2
2.	6	8	28	50	25	123
	3	2	34	37	48	481
	5	4	56	23	7	73
	4	6	67	52	36	29
	7	5	41	18	29	167
	3	3	29	26	54	423
	8	7	73	32	83	65
	9	4	26	54	30	122
3.	65	42	76	81	34	49
	56	54	37	19	46	74
	34	12	69	56	94	329
	43	53	74	68	67	·98
	14	55	33	74	52	72
	64	45	23	48	29	445
	50	34	14	33	43	94
	30	40	50	60	70	80

Add rapidly and test, finding 3 answers in 1 minute.

Write the answers on a piece of paper placed beneath the examples.

	a	b	c	d	e
1.	2345	3256	3556	4325	2546
	3253	5433	5234	2534	3452
	1432	2345	3245	3523	2543
	2564	4356	5243	2456	3245
	7316	5134	2356	5346	1236
2.	2434	3245	2546	6513	5342
	3256	1452	4532	3245	4254
	5145	5416	3251	5314	6143
	4253	2533	5424	2425	3325
	3242	3254	1243	5253	2543
3.	6325	6436	6323	6546	6546
	4264	2462	2566	3562	4362
	2633	6354	6344	6255	6543
	1462	5633	2565	5364	2544
	6326	3265	6355	4534	6355

4. Give sums rapidly, thus: $34 + 30 + 6 = 70$.

$34 + 36$	$56 + 56$	$28 + 38$	$48 + 64$	$25 + 56$
$56 + 45$	$67 + 48$	$47 + 39$	$37 + 25$	$66 + 39$
$38 + 17$	$37 + 26$	$59 + 17$	$35 + 45$	$25 + 28$
$29 + 16$	$25 + 47$	$57 + 26$	$65 + 29$	$38 + 26$
$19 + 28$	$48 + 25$	$39 + 59$	$47 + 47$	$29 + 25$

1. From 803 subtract 576.

$$7\,9\,13$$
$$8\,0\,3 = 7\text{ hundreds} + 9\text{ tens} + 13\text{ ones}$$
$$5\,7\,6 = 5\text{ hundreds} + 7\text{ tens} + \ \ 6\text{ ones}$$
$$\overline{2\,2\,7 = 2\text{ hundreds} + 2\text{ tens} + \ \ 7\text{ ones}}$$

FIRST METHOD*

Think:

Ones. $6 + 7 = 13$. Write **7**.

Tens. $7 + 2 = 9$. Write **2**.

Hundreds. $5 + 2 = 7$. Write **2**.

SECOND METHOD*

Think:

Ones. $13 - 6 = 7$. Write **7**.

Tens. $9 - 7 = 2$. Write **2**.

Hundreds. $7 - 5 = 2$. Write **2**.

Subtract and test:

	a	*b*	*c*	*d*	*e*	*f*
2.	604	809	701	902	606	705
	160	341	202	720	408	496
3.	2042	4106	5001	8012	4400	1407
	1012	2014	3014	5707	3870	1289

Read; then subtract and test:

	a	*b*	*c*	*d*	*e*
4.	8404	7604	5041	5202	7011
	3625	4896	1979	1824	4583
5.	7024	8401	5401	8704	4087
	3767	4574	2519	6247	1069

* See note, page 88.

1. From 700 take 264.

6 9 10
7 0 0 = 6 hundreds + 9 tens + 10 ones
2 6 4 = 2 hundreds + 6 tens +   4 ones
4 3 6 = 4 hundreds + 3 tens +   6 ones

Subtract and test:

	a	b	c	d	e	f
2.	500	600	900	400	800	700
	154	247	678	197	372	309
3.	300	700	600	800	200	400
	263	288	327	561	181	397
4.	300	800	800	100	600	500
	194	245	769	91	448	238

5. Make, solve, and test 20 examples like the above.
Subtract and test:

	a	b	c	d	e	f
6.	769	819	346	665	749	864
	374	568	94	374	298	539
7.	332	748	552	175	729	534
	140	339	429	68	549	360

Subtraction by Endings

Subtract rapidly:

8. $18 - 9$ $28 - 9$ $38 - 9$ $48 - 9$ $68 - 9$ $98 - 9$

9. $17 - 9$ $27 - 9$ $37 - 9$ $47 - 9$ $77 - 9$ $87 - 9$

Subtract and test. Try to find the *right answers* to five examples in 1 minute.

	a	b	c	d	e
1.	6432	7244	6475	7994	8641
	4176	5371	3879	3877	1282
2.	4531	4351	4234	2432	2134
	1522	1543	1235	1344	1545
3.	5423	4215	3254	3524	8231
	2545	1567	1565	1566	4743
4.	4253	3231	5453	8121	6414
	1464	1865	1974	3642	3892
5.	6304	7065	6401	8014	4706
	3168	1474	3162	6202	2165
6.	4060	8305	8560	6070	4904
	2976	6012	3574	4304	1060
7.	6105	7805	6099	3940	6303
	2166	4991	4814	2108	1494
8.	8110	4444	6222	8314	8196
	4884	2666	4879	6070	7246

9–28. Write the four numbers under 1 *a* and 2 *a*, (6432, 4176, 4531, 1522) and add them. Do the same with 1 and 2 in each of the other columns; then with 3 and 4; then with 5 and 6; and then with 7 and 8.

1. From 5000 take 3456.

.4 9 9 10
5 0 0 0 = 4 thousands + 9 hundreds + 9 tens + 10 ones
3 4 5 6 = 3 thousands + 4 hundreds + 5 tens + 6 ones
1 5 4 4 = 1 thousand + 5 hundreds + 4 tens + 4 ones

Subtract:

	a	*b*	*c*	*d*	*e*
2.	6734	8090	7004	6000	9000
	4578	5694	5896	4187	3999
3.	9084	7604	5003	8460	6080
	6097	4909	3806	7469	5908
4.	9600	7039	6800	7001	4403
	3097	6799	5009	1903	3040
5.	5004	8040	7409	6400	7003
	3904	4409	3790	4986	6800
6.	8703	6009	8001	5904	9873
	5008	4939	6809	3400	4980
7.	7003	5900	9204	7405	5900
	4906	3098	8909	6097	4397
8.	8040	6000	5020	4340	9000
	5787	4349	2345	2367	4989
9.	7504	9786	6340	7200	8069
	6308	5897	4689	4934	5980

1. Ralph had a collection of 4370 stamps and Arthur had 3745 stamps. How many more stamps did Ralph have than Arthur?

2. In the Central School there were 398 pupils; in the Garfield School, 1045; and in the Holmes School, 2306. How many pupils were there in the three schools?

3. John lived 5906 feet from school, and Thomas lived 2194 feet nearer the school than John. How far did Thomas live from school?

4. Ada counted the people in a parade. In the first group there were 208; in the second, 890; in the third, 1506; and in the fourth, 1781. How many were there in all?

5. In two city schools, the boys paraded as soldiers. In the first school there were 1790 boys; in the second school there were 279 fewer boys than in the first. How many boys were there in the second school?

6. A merchant sold for the fourth of July, 3706 small flags, 1712 larger flags, and 19 flags for flag poles. How many flags did he sell?

7. John took 1370 steps to school and Paul took 940 fewer steps than John. How many steps did Paul take?

8. A street-car conductor collected 103 fares on the first trip, 72 on the second trip, 176 on the third trip, and 89 on the fourth trip. How many fares did he collect?

1. Add :   2. Subtract :

$ 69.41   Add or subtract as before, and $ 547.58
  33.58   place the point in the answer   128.34
  62.75   under the other points.   ‾‾‾‾‾‾‾‾
‾‾‾‾‾‾‾‾ $ 419.24
$ 165.74

Add :

	a	b	c	d
3.	$ 32.45	$ 50.75	$ 32.11	$ 321.65
	61.79	1.24	2.84	94.76
	8.15	6.19	16.31	8.92
	23.42	83.72	5.49	143.74
4.	$ 35.18	$ 85.24	$ 21.89	$ 86.42
	92.76	8.93	39.65	93.84
	9.84	16.82	84.21	2.69
	26.37	73.25	16.93	39.87

Subtract :

	a	b	c	d
5.	$ 275.43	$ 536.75	$ 408.37	$ 674.26
	167.35	308.28	276.58	210.75
6.	$ 682.72	$ 826.45	$ 527.05	$ 763.72
	79.80	60.76	89.98	140.80
7	$ 869.50	$ 721.80	$ 800.00	$ 700.00
	678.85	643.55	589.36	476.85
8.	$ 423.75	$ 521.00	$ 900.00	$ 600.00
	246.95	239.94	746.75	489.58

Read and add:

	a	b	c	d
1.	$ 246.25	$ 632.75	$ 327.56	$ 805.96
	318.75	738.49	928.89	613.73
	92.48	918.86	738.86	928.45
	18.64	29.94	198.37	56.91
	237.75	169.83	75.59	219.87
2.	$ 178.84	$ 219.35	$ 165.27	$ 214.56
	6.92	7.29	86.15	3.94
	175.49	216.87	283.85	69.47
	862.81	938.75	395.94	138.85
	219.97	139.49	415.86	475.27
3.	$ 465.75	$ 37.28	$ 692.37	$ 475.84
	193.85	87.96	375.84	215.79
	276.49	29.49	49.86	936.93
	475.98	18.07	126.92	214.85

Subtract and test:

	a	b	c	d
4.	$ 475.36	$ 435.24	$ 438.64	$ 821.42
	196.28	178.95	195.73	195.38
5.	$ 317.61	$ 124.15	$ 326.47	$ 412.49
	219.84	95.76	158.96	273.89
6.	$ 246.37	$ 235.55	$ 831.02	$ 903.05
	174.75	169.73	567.89	395.48

(Notice the groups that make 10 or 15.)

Add:

	a	b	c	d	e
1.	$15.73	$30.86⎱₁₅	$ 6.93	$ .48	$ .17
	6.98	15.29⎰	32.63	2.75	.28
	.37⎱₁₅	8.88	4.30	.76	5.70
	5.18⎰	.68⎱₁₅	12.51	5.85	16.37
	40.60	7.27⎰	8.78	40.20	4.70
	5.89⎱₁₀	23.85⎱₁₀	.36	6.58	23.96
	.31⎰	.25⎰	.50	18.64	.85

2. Mr. Foster sold in 5 days as follows. Find each day's sales, total sales, and receipts for each article :

	MON.	TUES.	WED.	THURS.	FRI.
	a	b	c	d	e
Corn,	$75.25	$68.75	$27.35	$87.45	$64.65
Oats,	18.42	26.73	16.72	29.63	37.26
Bran,	6.75	3.75	8.25	7.75	9.45
Chop,	12.34	8.65	17.38	15.24	16.28
Meal,	3.60	5.40	7.60	12.60	17.20
Flour,	47.25	68.25	78.75	89.25	110.25

3. The deposits in a school savings bank in 7 months were as follows : $145.75, $123.34, $134.89, $645.75, $800.05, $900.25, $845.52. How much was deposited in all ?

4. My expenses for 6 days were $1.42, $2.05, $2.36, $2.12, $1.45 and $2.15. What were my total expenses for these six days ?

Secure toy money, or make circles from cardboard to represent the different pieces.

Appoint storekeepers and purchasers, and have the counting done in the schoolroom.

1. Kate's purchase.　　　　**2. John's purchase.**

Kate's purchase		Storekeeper	John's purchase	
Sugar,	10¢	The storekeeper,	Pencils,	15¢
Butter,	15¢	when making the	Pens,	5¢
Potatoes,	12¢	change, says: "37,	Ruler,	2¢
Cost,	37¢	38, 39, 40, 50."	Pad,	20¢
	1¢	Change, 13¢.	Cost,	42¢
Change,	1¢			1¢
	1¢		Change,	1¢
	10¢			1¢
	50¢			5¢
				50¢

3. Philip bought meat for 30¢ and milk for 8¢. How much change should he receive from 50¢?

Make change from 50¢ for:

4. Oranges for 15¢, lemons for 8¢, pears for 5¢.

5. Popcorn for 6¢, fruit for 10¢, nuts for 25¢.

6. Rice for 8¢, tapioca for 15¢, prunes for 10¢.

7. Potatoes for 15¢, bread for 8¢, turnips for 12¢.

8. Plums for 20¢, sugar for 10¢, pepper for 8¢.

9. Celery for 7¢, lettuce for 9¢, spinach for 12¢.

10. Corn for 12¢, seed for 25¢, apples for 10¢.

Groceries

Make change from 25¢ for:

1. 2 lb. of rice at 8¢ a pound.

2. 1 cake of soap for 6¢.

3. ½ lb. of nut butter at 34¢ a pound.

4. 2 boxes of stove polish at 10¢ each.

5. ¼ lb. of ginger at 40¢ a pound.

Dry Goods

Make change from 50¢ for:

6. 3 collars at 10¢ each.

7. 4 yd. of lace at 8¢ a yard.

8. 3 doz. buttons at 15¢ a dozen.

9. 2 yd. of elastic at 8¢ a yard.

Meats

Make change from a dollar for:

10. 2 lb. of veal at 34¢ a pound.

11. 1 chicken for 87¢.

12. 2 lb. of chops at 30¢ a pound.

13. 2 lb. of steak at 45¢ a pound.

1. A boy's sales from his school garden were as follows: $3.25, $7.15, $2.45, $6.45, and $8.79. What was the amount of his sales?

2. A boy's suit that was marked down from $6.98 was sold for $5.49. What was the reduction?

3. James had . $5.94; he spent $2.75 for thrift stamps. How much had he left?

4. What is the difference in the price of two hats marked $4.50 and $3.60?

5. The following amounts were deposited in the school savings bank: $2.15, $1.65, $7.09, $3.68, and $9.15. What was the total of these deposits?

6. Mrs. Allen paid $2.75 for a turkey, $.30 for cranberries, $.56 for butter, and $.48 for coffee. What was the whole cost?

7. How many school badges 4 in. long can be made from 2 yd. of ribbon?

8. A clock that strikes the hours strikes how many strokes between one o'clock and six inclusive?

9. How many square inches are there in an 8-inch square?

10. There are 639 oranges in 9 baskets, with the same number in each. How many are there in each basket?

11. If you receive $2.75, $6.96, and $8.15 and want to change it into five-dollar bills, how many should you get and how much money over?

1. A man paid $ 2.50 for a hat and $ 25.50 for a suit. How much did he pay for both ?

$ 2.50, cost of hat

25.50, cost of suit

$28.00, cost of both

2. A farmer sold 425 bu. of potatoes, 232 bu. of apples, and 189 bu. of onions. Find the total number of bushels sold.

3. A lady paid $ 25 for a carpet, $ 71 for a rug, and $ 7 for curtains. What was the amount of her bill ?

4. How many days are there from July 1 through December 31 ?

5. A man left $ 9845 to his wife, $ 3650 to his son, and $ 3500 to his daughter. How much did he leave to all three ? *

6. John's father sold his house for $ 5675, thereby losing $ 897. How much did the house cost ?

7. Arthur's vegetable garden is 30 ft. long and 24 ft. wide. How many feet is it around the garden ?

8. The distance from New York to Philadelphia by rail is 92 miles and the distance from Philadelphia to Baltimore is 95 miles. How far is it from New York to Baltimore ?

* Before solving, *estimate* the answer mentally thus : $ 10,000 + $ 3500 + $ 3500 = $ 17,000. Then find the exact answer, and compare the results. How much do they differ ?

1. Show by adding ten 2's that $10 \times 2 = 20$; show by adding ten 3's that $10 \times 3 = 30$; and so on.

2. Count by 10's to 120. Build the table of 10's.

3. Place a zero to the right of 4. What number have you? 40 is how many times 4? Place a zero to the right of 6; 3; 7; 9; 11; 12. See whether each product has become ten times the number.

Annexing a zero to the right of a number multiplies it by 10.

4. Annex 0 to each number. Notice the effect:

4	20	36	75	42	87	275
93	87	692	387	509	938	765

5. Memorize this table:

$10 \times 1 = 10$	$10 \times 7 = 70$
$10 \times 2 = 20$	$10 \times 8 = 80$
$10 \times 3 = 30$	$10 \times 9 = 90$
$10 \times 4 = 40$	$10 \times 10 = 100$
$10 \times 5 = 50$	$10 \times 11 = 110$
$10 \times 6 = 60$	$10 \times 12 = 120$

6. Compare:

10×5 with 5×10

8×10 with 10×8

11×10 with 10×11

120 and 12   110 and 11

Find the cost of:

7. 10 newspapers at 5¢.

8. 5 ladies' hats at $10.

9. 10 oranges at 2 for 5¢.

10. 10 yd. muslin at 12¢.

11. 9 lb. lard at 10¢.

12. 12 doz. buttons at 10¢.

13. 10 qt. milk at 14¢.

14. 10 bu. tomatoes at 80¢.

1. Beginning with 0 count by 10's to 100. Beginning with 1 count by 10's to 101.

2. 50 is how many times 5? How does 60 compare with 6? Remove the zero from 80. What is the result? 8 is what part of 80?

3. Remove the zero from 30; from 90; from 70 How does each result compare with the number?

4. 3 is what part of 30? $\frac{1}{10}$ of 30 = ? 4 is what part of 40? $\frac{1}{10}$ of 40 = ?

Removing a zero from the right of any number divides it by 10.

5. Divide by 10. Complete in two minutes.

40	30	90	80	60	100	120
320	520	980	750	360	470	920
1450	1680	2450	1930	2210	9990	7400
6320	4040	3100	2010	8500	7280	6900

6. How many 10-minute lesson periods are there in an hour?

7. At 10 cents a pound, how many pounds of sugar can be bought for 90 cents?

8. How long will it take a car, going 10 miles an hour, to travel 140 miles?

9. If I pay 50 ¢ for a telegram of 10 words, how much do I pay for each word?

1. Show by adding eleven 2's that $11 \times 2 = 22$; show by adding eleven 3's that $11 \times 3 = 33$; and so on.

2. Count by 11's to 132.   Build the table of 11's.

3. $9 \times 11 \times = ?$ $10 \times 11 = ?$ $11 \times 11 = ?$
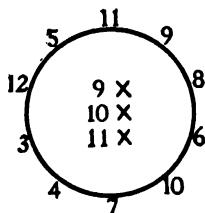
4. To find 12×11 how many must be added to 11×11 ? $12 \times 11 = ?$

5. Give the products :

$10 \times \$11$	$12 \times 11\cancel{c}$	5×11 boys
$3 \times \$11$	$4 \times 11\cancel{c}$	8×11 pens
$6 \times \$11$	$11 \times 9\cancel{c}$	11×7 days

6. Memorize this table :

$11 \times 1 = 11$	$11 \times 7 = 77$
$11 \times 2 = 22$	$11 \times 8 = 88$
$11 \times 3 = 33$	$11 \times 9 = 99$
$11 \times 4 = 44$	$11 \times 10 = 110$
$11 \times 5 = 55$	$11 \times 11 = 121$
$11 \times 6 = 66$	$11 \times 12 = 132$

7. Compare :

11×7 with 7×11

9×11 with 11×9

11×4 with 4×11

12×11 with 11×12

6×11 with 11×6

8. Find the products :

11×60	11×80	11×40	11×100	$11 \times \$35$
11×90	11×50	11×20	11×45	$11 \times \$25$
11×13	11×30	11×70	11×15	$11 \times \$18$

9. Find the cost of 11 pads at $9\cancel{c}$ each; at $11\cancel{c}$ each; at $12\cancel{c}$ each.

1. Show by adding twelve 2's that $12 \times 2 = 24$; show by adding twelve 3's that $12 \times 3 = 36$; and so on.

2. Count by 12's to 144. Build the table of 12's.

3. Memorize this table:

$12 \times 1 = 12$	$12 \times 7 = 84$
$12 \times 2 = 24$	$12 \times 8 = 96$
$12 \times 3 = 36$	$12 \times 9 = 108$
$12 \times 4 = 48$	$12 \times 10 = 120$
$12 \times 5 = 60$	$12 \times 11 = 132$
$12 \times 6 = 72$	$12 \times 12 = 144$

4. Multiply by 12; by 11:

465	236	789
546	783	928
784	937	693
785	514	938
978	694	296

1 dozen = 12	1 gross = 144

5. What two numbers make the following products?

25	27	28	30	32	35	36	40	42	45	48
49	56	60	63	64	66	72	80	84	88	96

Multiply by 12:

	a	b	c	d	e
6.	152 nuts	$264	371¢	468	156
7.	384 trees	$780	529¢	795	579
8.	291 ships	$231	604¢	405	234

9. How many eggs are there in 612 boxes, each containing one dozen?

10. Find the weight of 12 barrels of flour, each weighing 196 pounds.

1. Subtract by 11's from 132 to 0.

2. Give the quotients and the remainders:

$33 \div 11$	$66 \div 11$	$88 \div 11$	$132 \div 11$
$44 \div 11$	$77 \div 11$	$99 \div 11$	$121 \div 11$
$48 \div 11$	$60 \div 11$	$73 \div 11$	$118 \div 11$

3. Find $\frac{1}{11}$ of: 99; 22; 55; 110; 132; 121.

Divide by 11 and test:

4. 2739	**7.** 6952	**10.** 8921	**13.** 69,751
5. 8294	**8.** 3982	**11.** 2156	**14.** 73,062
6. 2035	**9.** 3003	**12.** 8052	**15.** 90,090

16. Subtract by 12's from 144 to 0.

17. Give the quotients and the remainders:

$\$36 \div 12$	$60\cancel{c} \div 12$	$84 \div 12$	$132 \div 12$
$\$26 \div 12$	$97\cancel{c} \div 12$	$112 \div 12$	$140 \div 12$

18. Find $\frac{1}{12}$ of: 96; 84; 72; 36; 108; 24; 120; 132; 60; 48; 144.

Divide by 12 and test:

19. 3672	**24.** 7812	**29.** 42,192	**34.** 91,872
20. 4860	**25.** 2844	**30.** 69,372	**35.** 24,720
21. 6960	**26.** 9228	**31.** 73,944	**36.** 68,352
22. 7224	**27.** 4680	**32.** 82,656	**37.** 81,768
23. 4692	**28.** 9384	**33.** 37,296	**38.** 92,364

1. Divide 345 by 2.

2)345
172 ; r. 1

Think :

Hundreds. 2 in 3, **1**, with 1 r. Write **1**.
Tens. 2 in 14, **7**. Write **7**.
Ones. 2 in 5, **2**, with 1 r.

The answer is read "one hundred seventy-two, with 1 r." The abbreviation r. stands for **remainder**.

Divide :

	a	b	c	d
2.	789 by 2	284 by 3	793 by 2	3940 by **7**
3.	465 by 4	500 by 7	875 by 6	1945 by 4
4.	297 by 5	278 by 5	700 by 3	2378 by 3

5. Divide 461 by 2.

2)461
230 ; r. 1

Test. If the answer is correct, then 2 × 230 or 460, + 1, the remainder, will equal 461, the dividend.

Divide by 2 and test; by 3 :

	a	b	c	d	e
6.	265	864	786	624	7368
7.	713	219	269	578	2457

Divide by 4 and test; by 5 :

8.	268	936	6981	3874	4876
9.	864	468	5034	2190	3841
10.	225	338	2021	3000	2999

$1 \times 1 = 1$	$2 \times 1 = 2$	$3 \times 1 = 3$	$4 \times 1 = 4$
$1 \times 2 = 2$	$2 \times 2 = 4$	$3 \times 2 = 6$	$4 \times 2 = 8$
$1 \times 3 = 3$	$2 \times 3 = 6$	$3 \times 3 = 9$	$4 \times 3 = 12$
$1 \times 4 = 4$	$2 \times 4 = 8$	$3 \times 4 = 12$	$4 \times 4 = 16$
$1 \times 5 = 5$	$2 \times 5 = 10$	$3 \times 5 = 15$	$4 \times 5 = 20$
$1 \times 6 = 6$	$2 \times 6 = 12$	$3 \times 6 = 18$	$4 \times 6 = 24$
$1 \times 7 = 7$	$2 \times 7 = 14$	$3 \times 7 = 21$	$4 \times 7 = 28$
$1 \times 8 = 8$	$2 \times 8 = 16$	$3 \times 8 = 24$	$4 \times 8 = 32$
$1 \times 9 = 9$	$2 \times 9 = 18$	$3 \times 9 = 27$	$4 \times 9 = 36$
$1 \times 10 = 10$	$2 \times 10 = 20$	$3 \times 10 = 30$	$4 \times 10 = 40$
$1 \times 11 = 11$	$2 \times 11 = 22$	$3 \times 11 = 33$	$4 \times 11 = 44$
$1 \times 12 = 12$	$2 \times 12 = 24$	$3 \times 12 = 36$	$4 \times 12 = 48$
$5 \times 1 = 5$	$6 \times 1 = 6$	$7 \times 1 = 7$	$8 \times 1 = 8$
$5 \times 2 = 10$	$6 \times 2 = 12$	$7 \times 2 = 14$	$8 \times 2 = 16$
$5 \times 3 = 15$	$6 \times 3 = 18$	$7 \times 3 = 21$	$8 \times 3 = 24$
$5 \times 4 = 20$	$6 \times 4 = 24$	$7 \times 4 = 28$	$8 \times 4 = 32$
$5 \times 5 = 25$	$6 \times 5 = 30$	$7 \times 5 = 35$	$8 \times 5 = 40$
$5 \times 6 = 30$	$6 \times 6 = 36$	$7 \times 6 = 42$	$8 \times 6 = 48$
$5 \times 7 = 35$	$6 \times 7 = 42$	$7 \times 7 = 49$	$8 \times 7 = 56$
$5 \times 8 = 40$	$6 \times 8 = 48$	$7 \times 8 = 56$	$8 \times 8 = 64$
$5 \times 9 = 45$	$6 \times 9 = 54$	$7 \times 9 = 63$	$8 \times 9 = 72$
$5 \times 10 = 50$	$6 \times 10 = 60$	$7 \times 10 = 70$	$8 \times 10 = 80$
$5 \times 11 = 55$	$6 \times 11 = 66$	$7 \times 11 = 77$	$8 \times 11 = 88$
$5 \times 12 = 60$	$6 \times 12 = 72$	$7 \times 12 = 84$	$8 \times 12 = 96$
$9 \times 1 = 9$	$10 \times 1 = 10$	$11 \times 1 = 11$	$12 \times 1 = 12$
$9 \times 2 = 18$	$10 \times 2 = 20$	$11 \times 2 = 22$	$12 \times 2 = 24$
$9 \times 3 = 27$	$10 \times 3 = 30$	$11 \times 3 = 33$	$12 \times 3 = 36$
$9 \times 4 = 36$	$10 \times 4 = 40$	$11 \times 4 = 44$	$12 \times 4 = 48$
$9 \times 5 = 45$	$10 \times 5 = 50$	$11 \times 5 = 55$	$12 \times 5 = 60$
$9 \times 6 = 54$	$10 \times 6 = 60$	$11 \times 6 = 66$	$12 \times 6 = 72$
$9 \times 7 = 63$	$10 \times 7 = 70$	$11 \times 7 = 77$	$12 \times 7 = 84$
$9 \times 8 = 72$	$10 \times 8 = 80$	$11 \times 8 = 88$	$12 \times 8 = 96$
$9 \times 9 = 81$	$10 \times 9 = 90$	$11 \times 9 = 99$	$12 \times 9 = 108$
$9 \times 10 = 90$	$10 \times 10 = 100$	$11 \times 10 = 110$	$12 \times 10 = 120$
$9 \times 11 = 99$	$10 \times 11 = 110$	$11 \times 11 = 121$	$12 \times 11 = 132$
$9 \times 12 = 108$	$10 \times 12 = 120$	$11 \times 12 = 132$	$12 \times 12 = 144$

1. Annex a zero to the right of ·3; then multiply 3 by 10.   Is there any difference in the result?

Annexing a zero to the right of a number multiplies it by 10.

2. Multiply by 10: 40; 20; 60; 800; 300; 700.

3. Multiply 3 by 100; 8 by 100; 9 by 100; 20 by 100.   How many times as large has each of the numbers become?   How many zeros were added to each?

Annexing two zeros to the right of a number multiplies it by 100.

4. Find the products:

100×4	100×15	100×50	100×75
100×5	100×37	100×91	100×36

5. Multiply 3 by 1000.   How many zeros did you annex to 3?   Multiply 6 by 1000.   How many zeros did you annex to 6?   Multiply 8 by 1000; 9 by 1000. How many times as large has each number become?

Annexing three zeros to the right of a number multiplies it by 1000.

6. From what you have learned, make a rule for multiplying any number by 10; by 100; by 1000.

7. Multiply:

2 by 1000; 7 by 1000; 5 by 1000; 4 by 1000; 25 by 100; 36 by 10; 72 by 10; 72 by 100; 72 by 1000.

1. How many cents are there in 100 dimes?

2. How many cents are there in $6?

Find the weight of:

3. 100 two-pound packages of rolled oats.

4. 100 five-pound boxes of starch.

5. 25 one-hundred-pound kegs of nails.

6. 100 lambs at an average of 45 lb. each.

7. Find the cost of 100 two-cent picture postcards and 100 three-cent stamps.

8. Multiply 63 by 200.

63
200
12600

Write the 2 of the multiplier under the figure in ones' place of the multiplicand. $2 \times 63 = 126$. Annex two zeros to the right of 126, making 12600. $100 \times 63 = 6300$; $200 \times 63 = 12600$.

Multiply:

9.	71	**10.**	85	**11.**	245	**12.**	715
	200		300		400		700

13. 347 by 20   **18.** 293 by 500   **23.** 481 by 200

14. 409 by 30   **19.** 786 by 700   **24.** 894 by 400

15. 715 by 60   **20.** 184 by 400   **25.** 906 by 700

16. 329 by 80   **21.** 796 by 600   **26.** 728 by 900

17. 475 by 90   **22.** 832 by 200   **27.** 365 by 120

1. Divide 60 by 10.   Remove 0 from 60.

2. Compare 60 and 6; 40 and 4; 30 and 3.   What effect has the removing of one zero from the right of a number upon the value of the number?

3. Divide by 10 : 20; 900; 350; 470; 530; 260.

4. Divide 600 by 100.   Remove two zeros from 600. Compare 900 divided by 100 with 9∅∅.   What effect has the removing of two zeros from the right of a number upon the value of the number?

5. Compare 3000 ÷ 1000 with 3∅∅∅.   Compare 9000 ÷ 1000 with 9∅∅∅.   How many zeros are removed from the right of 3000 when it is divided by 1000? from the right of 9000?   What effect has the removing of three zeros from the right of a number upon the number?

Removing one zero from the right of a number divides the number by 10; *removing two zeros divides it by* 100; *removing three zeros divides it by* 1000, *etc.*

Find the quotients:

6.	30 ÷ 10	**10.**	300 ÷ 100	**14.**	4000 ÷ 1000
7.	90 ÷ 10	**11.**	600 ÷ 100	**15.**	5000 ÷ 1000
8.	70 ÷ 10	**12.**	700 ÷ 100	**16.**	9000 ÷ 1000
9.	200 ÷ 10	**13.**	900 ÷ 100	**17.**	7000 ÷ 1000

24 ÷ 6 = 4.   Divide both dividend and divisor by 3. Then 8 ÷ 2 = 4.

Show also that 36 ÷ 9 = 12 ÷ 3.

Dividing both dividend and divisor by the same number does not alter the quotient.

1. Divide 1460 by 20.

20)1460
73

Removing one zero, or the same number of zeros, from *both dividend and divisor* does not change the quo-

200)14600
73

tient, since it is the same as dividing both dividend and divisor by the same number.

Find the quotients:

2.	$80 \div 20$	**6.**	$900 \div 100$	**10.**	$12,000 \div 1000$
3.	$60 \div 30$	**7.**	$1000 \div 100$	**11.**	$12,000 \div 2000$
4.	$90 \div 10$	**8.**	$6000 \div 200$	**12.**	$18,000 \div 3000$
5.	$40 \div 20$	**9.**	$8400 \div 400$	**13.**	$16,000 \div 4000$

14. How many 10-gallon cans will a dealer use in shipping 200 gallons of milk?

15. How many 20-pound packages can be made from 1000 pounds of coffee?

16. 2000 pounds of crackers were shipped in 400 boxes. How many pounds did each box contain?

17. How many $20 coats were sold for $2400?

18. A man bought a house for $3500. How many months will it take to pay for it at $100 a month?

Give the quotients:

19.	$160 \div 40$	**23.**	$200 \div 50$	**27.**	$750 \div 15$
20.	$360 \div 30$	**24.**	$480 \div 80$	**28.**	$300 \div 60$
21.	$900 \div 90$	**25.**	$480 \div 60$	**29.**	$250 \div 25$
22.	$750 \div 30$	**26.**	$220 \div 110$	**30.**	$600 \div 50$

1. Multiply 64 by 23.

<table>
<tr><td></td><td></td><td>SHORT FORM</td></tr>
<tr><td>Multiplicand,</td><td>64</td><td>64</td></tr>
<tr><td>Multiplier,</td><td>23</td><td>23</td></tr>
<tr><td>1st partial product,</td><td>192 = 3 × 64</td><td>192</td></tr>
<tr><td>2d partial product,</td><td>1280 = 20 × 64</td><td>128</td></tr>
<tr><td>Entire product,</td><td>1472 = 23 × 64</td><td>1472</td></tr>
</table>

In practice the 0 in the second partial product is omitted, and 1280 is written as 128 *tens* by placing the right-hand figure of that product in *tens'* place.

The number multiplied is called the **multiplicand**.

The number showing how many times the multiplicand is taken is called the **multiplier**.

The result in multiplication is called the **product**.

2.	3.	4.	5.
327	203	6004	3060
35	42	73	89
1635	406	18012	27540
981	812	42028	24480
11445	8526	438292	272340

Multiply:

	a	b	c	d	e
6.	603	645	863	765	806
	24	32	24	35	43
7.	908	306	609	967	867
	23	76	79	47	39
8.	200	300	706	659	908
	56	49	87	69	79

Multiply:

1. 426 by 23		**10.** 634 by 37		**19.** 9006 by 48
2. 372 by 41		**11.** 298 by 73		**20.** 2694 by 75
3. 256 by 33		**12.** 604 by 48		**21.** 8002 by 38
4. 307 by 32		**13.** 729 by 40		**22.** 4293 by 67
5. 269 by 43		**14.** 903 by 86		**23.** 9128 by 39
6. 307 by 27		**15.** 694 by 79		**24.** 2807 by 74
7. 538 by 36		**16.** 928 by 89		**25.** 6293 by 56
8. 736 by 63		**17.** 726 by 75		**26.** 4060 by 13
9. 487 by 52		**18.** 349 by 28		**27.** 2734 by 27

Give the products rapidly:

	a	b	c	d
28.	50×90	20×20	60×60	20×80
29.	80×70	30×30	70×70	40×30
30.	90×70	40×40	80×80	70×60
31.	60×50	50×50	90×90	70×40

Multiply :

32. 463 by 73		**34.** 9869 by 84		**36.** 8693 by 28
33. 938 by 84		**35.** 3278 by 93		**37.** 9281 by 39

38. Our teacher ordered 288 pads. Each pad contained 48 sheets of paper. How many sheets did she have?

39. An airplane averaged 109 miles an hour. How far did it fly in 17 hours?

1. Multiply 694 by 326.

<div style="text-align:center">SHORT FORM</div>

694		**694**
326		**326**
$\overline{4164} =$	**6 × 694**	**4164**
13880 =	**20 × 694**	**1388**
208200 =	**300 × 694**	**2082**
226244 =	**326 × 694**	**226244**

When multiplying by 3 hundreds, write the partial product as 2082 *hundreds* by placing the first figure of that product under *hundreds*.

Multiply:

2.	462	**4.**	283	**6.**	619	**8.**	543
	375		243		128		264
3.	475	**5.**	267	**7.**	387	**9.**	476
	325		364		918		842

10. 465 by 327	**15.** 538 by 147	**20.** 467 by 275
11. 289 by 943	**16.** 249 by 316	**21.** 839 by 843
12. 568 by 769	**17.** 987 by 827	**22.** 761 by 972
13. 987 by 938	**18.** 734 by 695	**23.** 398 by 867
14. 478 by 783	**19.** 938 by 783	**24.** 485 by 984

25. One barrel of flour contains 196 pounds. How many pounds do 125 barrels contain?

26. There are 158 schools in a county, with an average of 268 pupils each. How many pupils are there in the county?

1. Multiply 273 by 304.

	SHORT FORM
273	273
304	304
$\overline{1092} = \quad 4 \times 273$	$\overline{1092}$
$81900 = 300 \times 273$	819
$\overline{82992} = \overline{304} \times 273$	$\overline{82992}$

Work in the short form, omitting the zeros in units and tens in the second partial product.

When multiplying by 3 hundreds, write the partial product as 819 *hundreds* by placing the right-hand figure of that product in *hundreds'* place.

Multiply:

	a	b	c	d	e
2.	316	275	428	506	709
	502	306	405	307	508
3.	243	709	608	705	908
	308	504	209	804	607

4. Use as the multiplier the number that will require fewer partial products.

5. Multiply 278 by 480.

278
480
$\overline{22240}$
1112
$\overline{133440}$

6. $746 \times 359 = ?$

7. $296 \times 480 = ?$

8. $374 \times 240 = ?$

9. $604 \times 347 = ?$

10. $200 \times 569 = ?$

11. $500 \times 358 = ?$

12. $220 \times 842 = ?$

13. $751 \times 600 = ?$

14. $304 \times 509 = ?$

15. $907 \times 800 = ?$

Answer rapidly :

1. $2\overline{)32}$　　$3\overline{)48}$　　　$4\overline{)44}$　　　$5\overline{)35}$　　　$5\overline{)75}$

2. $6\overline{)72}$　　$7\overline{)147}$　　$8\overline{)872}$　　$9\overline{)3699}$　　$8\overline{)4056}$

3. $\frac{1}{2}$ of 16; 18; 26; 28; 32; 36; 40.

4. $\frac{1}{3}$ of 24; 27; 36; 18; 60; 90; 120.

5. $\frac{1}{4}$ of 48; 24; 60; 72; 36; 44; 56.

6. $\frac{1}{5}$ of 60; 55; 100; 150; 75; 45; 65.

7. $\frac{1}{6}$ of 72; 96; 84; 24; 48; 240; 36.

8. $\frac{1}{7}$ of 84; 91; 49; 63; 105; 350; 2100.

9. $\frac{1}{8}$ of 96; 72; 640; 960; 560; 120; 880.

10. $\frac{1}{9}$ of 54; 135; 360; 720; 108; 7209; 1080.

11. $\frac{1}{10}$ of 100; 120; 130; 190; 1250; 1950; 1780.

12. $\frac{1}{11}$ of 77; 88; 99; 132; 1100; 1320; 1210.

13. $\frac{1}{12}$ of 96; 84; 144; 288; 960; 840; 1080.

Divide and test :

14. $11\overline{)6303}$　　$11\overline{)2243}$　　$11\overline{)2882}$　　$11\overline{)6699}$

15. $12\overline{)96840}$　　$12\overline{)89640}$　　$12\overline{)6072}$　　$12\overline{)9060}$

Give the quotients rapidly :

16. $8\overline{)96}$　　$9\overline{)72}$　　$10\overline{)190}$　　$11\overline{)121}$　　$12\overline{)96}$

1. Divide 240 by 15.

```
          16, Quotient
Divisor, 15)240, Dividend
          15
          ‾‾
          90
          90
          ‾‾
```

In long division the quotient is placed *over* the dividend.

15 is contained in 24, 1 time. Write **1** in the quotient, *directly over* 4.

Multiply 15 by 1, placing the product, 15, under 24.

Subtract 15 from 24. The remainder is 9.

Bring down the next figure, 0. 15 is contained in 90, 6 times. Write **6** in the quotient, *directly over* 0.

Multiply 15 by 6, placing the product, 90, under 90.

As there is no remainder, the quotient is 16.

The number divided is called the **dividend.**

The number by which we divide is called the **divisor.**

The answer in division is called the **quotient.**

Divide:

```
        21                  29                    24
2. 13)273          3. 25)725            4. 21)504
    26                  50                    42
    ‾‾                  ‾‾‾                   ‾‾
    13                  225                   84
    13                  225                   84
    ‾‾                  ‾‾‾                   ‾‾
```

STEPS IN EX. 4

1. Divide 50 by 21.　　4. Subtract 42 from 50.

2. Write quotient figure.　　5. Bring down next figure.

3. Multiply 21 by 2.　　Test. **21 × 24 = 504.**

5. Divide 441 by 21; 672 by 21; 903 by 21.

Think how many times the first figure of the divisor is contained in the first figure of the dividend. The number will be the first figure of the quotient.

1. $252 \div 21$ 4. $714 \div 21$ 7. $504 \div 21$

2. $525 \div 21$ 5. $651 \div 21$ 8. $2398 \div 21$

3. $861 \div 21$ 6. $357 \div 21$ 9. $2625 \div 21$

Think how many times the first figure of the divisor is contained in the first figure, or in the first two figures, of the dividend. The number will be the first figure of the quotient.

10. $713 \div 31$ 14. $7176 \div 23$ 18. $6930 \div 33$

11. $899 \div 31$ 15. $9476 \div 23$ 19. $1984 \div 32$

12. $6727 \div 31$ 16. $5028 \div 42$ 20. $2272 \div 32$

13. $8323 \div 41$ 17. $1344 \div 42$ 21. $1683 \div 51$

22. Divide 819 by 21.

$$\begin{array}{r} 4 \\ 21\overline{)819} \\ 84 \end{array}$$

Since the product of the divisor and quotient is greater than 81, the quotient figure is *too large*. Try a smaller quotient figure.

$$\begin{array}{r} 39 \\ 21\overline{)819} \\ 63 \\ \hline 189 \\ 189 \end{array}$$

23. Divide 651 by 21.

$$\begin{array}{r} 2 \\ 21\overline{)651} \\ 42 \\ \hline 23 \end{array}$$

Since the remainder is greater than the divisor, the quotient figure is *too small*. Try a larger quotient figure.

$$\begin{array}{r} 31 \\ 21\overline{)651} \\ 63 \\ \hline 21 \\ 21 \end{array}$$

HAM. ESS. AR. I — 11

Divide and test:

1. 21)882	17. 31)775	33. 42)1008
2. 21)903	18. 31)744	34. 42)1596
3. 21)504	19. 31)899	35. 42)1680
4. 21)819	20. 31)217	36. 42)1722
5. 21)315	21. 32)672	37. 43)1333
6. 21)567	22. 32)928	38. 43)6880
7. 21)399	23. 32)160	39. 43)9460
8. 21)441	24. 32)192	40. 43)1376
9. 22)880	25. 33)462	41. 51)1683
10. 22)638	26. 33)858	42. 51)3672
11. 22)352	27. 33)561	43. 51)3264
12. 22)660	28. 33)627	44. 51)1428
13. 23)575	29. 41)943	45. 52)1508
14. 23)736	30. 41)2296	46. 52)2288
15. 23)966	31. 41)1107	47. 53)2385
16. 23)138	32. 41)1435	48. 53)1908

49. If a bushel of oats weighs 32 lb., how many bushels will weigh 28,640 lb.?

50. How long will it take a train that travels 31 miles an hour to go a distance of 279 miles?

51. How many hours are there in 840 minutes?

52. There are 32 quarts in a bushel. How many bushels are there in 6912 quarts?

1. Divide 7410 by 28.

$$\begin{array}{r} 264 \text{ ; r. 18} \\ 28\overline{)7410} \\ 56 \\ \hline 181 \\ 168 \\ \hline 130 \\ 112 \\ \hline 18 \end{array}$$

NOTE. Since 28 is nearly 30, we may find the first figure more easily by dividing by 3 than by 2.

The quotient is 264 and the remainder, 18.

Test. $28 \times 264 = 7392$; $7392 + 18 = 7410$.

Divide and test :

2. 2397 by 51   **11.** 2542 by 41   **20.** 2058 by 27

3. 3888 by 86   **12.** 3567 by 87   **21.** 2668 by 31

4. 1302 by 21   **13.** 1281 by 21   **22.** 3592 by 43

5. 2945 by 38   **14.** 1703 by 27   **23.** 2047 by 83

6. 3213 by 13   **15.** 3034 by 46   **24.** 6938 by 94

7. 1827 by 27   **16.** 4697 by 61   **25.** 7159 by 39

8. 3007 by 36   **17.** 4368 by 98   **26.** 4918 by 94

9. 6256 by 81   **18.** 4544 by 76   **27.** 8168 by 86

10. 5096 by 95   **19.** 2867 by 61   **28.** 8925 by 28

29. Find the number of barrels of oil, 51 gallons each, that can be filled from a vessel containing 408 gallons.

30. How many barrels, of 51 gallons each, can be filled from a vessel containing 412 gallons and how many gallons will be left over ?

31. How many buildings, 75 ft. wide, can be erected on a street 300 ft. long ?

1. Divide 13,892 by 23.

What is the product of 6×23?
Is there any remainder?

```
      604
23)13892
    138
     92
     92
```

What is the next operation?

Does 9 contain 23? Since 9 does not contain 23, write 0 in the quotient, and bring down 2, making the number to be divided 92.

Find the quotients and test:

2. $26,322 \div 46$	**9.** $23,229 \div 29$	**16.** $56,079 \div 73$
3. $31,356 \div 39$	**10.** $73,784 \div 92$	**17.** $45,825 \div 65$
4. $23,641 \div 47$	**11.** $15,631 \div 77$	**18.** $19,844 \div 49$
5. $33,522 \div 37$	**12.** $36,792 \div 73$	**19.** $19,266 \div 38$
6. $31,590 \div 45$	**13.** $58,056 \div 82$	**20.** $83,396 \div 98$
7. $49,248 \div 81$	**14.** $67,596 \div 74$	**21.** $41,157 \div 51$
8. $20,130 \div 66$	**15.** $16,685 \div 54$	**22.** $15,100 \div 25$

Give the quotients rapidly:

23. $64 \div 32$	**30.** $200 \div 20$	**37.** $90 \div 15$
24. $96 \div 48$	**31.** $70 \div 35$	**38.** $60 \div 20$
25. $40 \div 20$	**32.** $45 \div 15$	**39.** $48 \div 24$
26. $50 \div 25$	**33.** $46 \div 23$	**40.** $56 \div 28$
27. $60 \div 30$	**34.** $56 \div 28$	**41.** $63 \div 21$
28. $90 \div 45$	**35.** $99 \div 33$	**42.** $84 \div 21$
29. $100 \div 50$	**36.** $64 \div 32$	**43.** $62 \div 31$

Multiply and test:

1. 8465
2. 7645
3. 8741
4. 9860
5. 8425 } by {
6. 9654
7. 7869
8. 9765

a. 22
b. 45
c. 50
d. 86
e. 76
f. 98
g. 56
h. 69

Form 8 groups of 8 examples each by multiplying each multiplicand by each multiplier, thus:

1 *a.* 22 × 8465 = ?
1 *d.* 86 × 8465 = ?
6 *e.* 76 × 9654 = ?

NOTE. The teacher may assign a different group to each of 8 class teams and notice which team makes the best record for speed and accuracy.

9. Divide 969 by 23.　　　10. Divide 969 by 24.

42 ; r. 3　　　　　　　　　　40 ; r. 9
23)969　　　　　　　　　　　24)969
　92　　　　　　　　　　　　　96
　─　　　　　　　　　　　　　─
　49　Test.　23 × 42 = 966 ; 966 + 3 = 969　9
　46
　─
　3

Divide and test:

11. 84,765
12. 57,672
13. 80,720
14. 50,724
15. 60,925 } by {
16. 86,412
17. 76,412
18. 83,456

a. 86
b. 78
c. 91
d. 59
e. 72
f. 67
g. 82
h. 65

Form 8 groups of 8 examples each by dividing each of the dividends by each of the divisors, thus:

11 *a.* 84,765 ÷ 86 = ?
16 *e.* 86,412 ÷ 72 = ?

NOTE. The teacher may assign these groups to 8 class teams, as above.

19. A dairy company owned 225 cows valued at $19,125. What was the average value of each cow?

20. At $48 each how many calves could be bought for $10,992?

Give the quotients rapidly :

	a	*b*	*c*	*d*
1.	$100 \div 10$	$280 \div 140$	$993 \div 331$	$315 \div 105$
2.	$500 \div 50$	$930 \div 310$	$645 \div 129$	$972 \div 324$
3.	$300 \div 30$	$860 \div 172$	$951 \div 317$	$725 \div 145$
4.	$250 \div 50$	$396 \div 132$	$284 \div 142$	$932 \div 466$
5.	$400 \div 80$	$960 \div 320$	$788 \div 197$	$260 \div 130$
6.	$844 \div 211$	$990 \div 330$	$882 \div 126$	$775 \div 155$

7. Divide 175,608 by 324.   8. Divide 793,320 by 264.

```
        542                      3005
  324)175608              264)793320
     1620                    792
     1360                    1320
     1296                    1320
      648
      648
```

Since 264 is larger than 13 and than 132, what do we write in the quotient ?

Divide :

	a	*b*	*c*
9.	63,596 by 126	46,785 by 135	13,940 by 340
10.	78,563 by 341	78,568 by 244	81,282 by 408
11.	48,842 by 144	65,375 by 255	23,674 by 726
12.	26,786 by 354	78,634 by 184	83,765 by 415
13.	46,785 by 165	79,673 by 263	27,854 by 129
14.	83,761 by 219	86,572 by 196	76,348 by 366

1. A foot = —— inches.

2. A yard = —— feet.
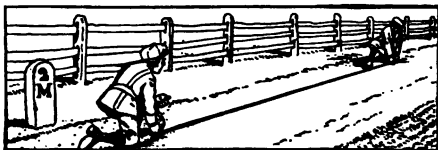
3. What measure should you use to measure the length of your book? of your desk? the width of your schoolroom? the length of the blackboard?

4. Measure $5\frac{1}{2}$ yards or $16\frac{1}{2}$ feet along the street or on the school ground. Call it **one rod.**

5. With a tape measure $5\frac{1}{2}$ yards long, measure the length and the width of your school grounds in yards and feet.

6. With a pole or a tape a rod in length, measure the distance in rods and feet around a square or a field.

7. 20 city blocks, each 16 rods in length, are 320 rods long. This is called **one mile. 1 mile = 320 rods.**

8. There are 5280 feet in 1 mile. How many feet are there in 3 miles?

9. Memorize this table:

> **12 inches (in.) = 1 foot (ft.)**
> **3 feet = 1 yard (yd.)**
> **$5\frac{1}{2}$ yards, or $16\frac{1}{2}$ feet = 1 rod (rd.)**
> **320 rods = 1 mile (mi.)**
> **5280 feet = 1 mile**

1. Measure a rod on the floor of the schoolroom. Pace the rod and tell approximately the number of paces to a rod.

2. Pace the width of the plot of ground on which the school is located and estimate the distance in rods.

3. By actual experience find the number of minutes required for you to walk one mile.

4. If you live near your school, determine the distance of your home from the school, either by pacing, or by finding the time required to walk that distance.

5. Estimate the length and the width of the school courts or playgrounds. Test your estimate by actual measurement.

6. Estimate the distance between your house and the house of a playmate. Test by measurement.

7. If you live in the city, count the number of blocks between your house and the school. About how far do you live from the school building?

8. Find the distance between two street lights. Estimate the number of street lights required for one mile.

9. Find the distance between two telegraph or telephone poles. How many poles that distance apart would be required for a mile?

10. Two cities are 50 miles apart. How many poles that distance apart would be required to extend telegraph wires between the two cities?

1. A sheet of paper is 15 inches in length and 8 inches in width. What is the distance around it in inches? in feet and inches over?

The distance around an oblong, or a square, is called its **perimeter**.

2. Measure the distance around the blackboard; around the teacher's desk; around the schoolroom floor.

3. Measure the perimeter of your schoolroom.

4. George wishes to build a wire netting fence around a lot 90 ft. long and 40 ft. wide. How many feet of fence are necessary?

5. The reading table in the library is 4 ft. long and 3 ft. wide. What is its perimeter in feet?

6. What is the perimeter of a field 40 rd. square? of a field 40 rd. by 30 rd.?

7. John's father owns a corner lot 125 ft. long and 25 ft. wide. What length of walk will it take for the front and the side?

8. 36 in. = —— ft.   14. 640 rd.   = —— mi.

9. 10 ft. = —— in.   15. 3 mi.   = —— rd.

10. 12 ft. = —— yd.   16. 10,560 ft. = —— mi.

11. 3 yd. = —— ft.   17. 3 mi.   = —— ft.

12. 11 yd. = —— rd.   18. 960 rd.   = —— mi.

13. 2 rd. = —— yd.   19. 10 mi.   = —— rd.

1. Draw a square inch; a square foot. What two things show that it is a *square* inch or a *square* foot?

2. Separate each side of a square foot into 12 equal parts. Connect these points by straight lines. What is the size of each square? the name of each square? How many square inches equal one square foot?

> **144 square inches (sq. in.) = 1 square foot (sq. ft.)**

3. Draw on the blackboard a square yard. What two things show that it is a *square* yard?

Let 1 inch stand for 1 foot. How long, then, is the side of the square that represents a square yard?

4. Represent a square yard by a square, each side of which is ¾ inch long. Then ¼ inch represents 1 foot. How long is each side of a square yard? How many square feet are there in each row? in the three rows? How many square feet are there, then, in 1 square yard?
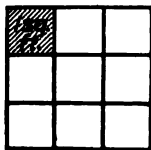
> **9 square feet = 1 square yard (sq. yd.)**

5. How many square inches are there in 8 sq. ft.?

6. In 864 sq. in. how many square feet are there?

7. Find the number of square feet in 10 sq. yd.

8. Estimate the number of square yards in the floor of the schoolroom. Test by actual measurement.

1. Let 1 inch stand for 1 foot and make a drawing to show the top of the teacher's desk, which is 4 ft. wide and 6 ft. long.

2. Let 1 inch stand for 2 feet and make a diagram of the blackboard, which is 4 ft. wide and 20 ft. long.

3. The school grounds are 200 ft. wide and 300 ft. long. Make a drawing of the grounds in which 1 inch stands for 50 feet.

SUGGESTION. If 1 inch represents 50 feet, 4 inches represent 200 feet and 6 inches represent 300 feet.

4. Draw an oblong 4 in. by 4 in. and tell the number of square inches it contains.

5. A rug is 9 ft. by 12 ft. Make a drawing on a convenient scale to show this. How many square feet does it contain?

6. A schoolroom floor is 30 ft. by 40 ft. How many square feet does it contain?

7. Measure your rugs and rooms at home and make diagrams on a convenient scale to show their sizes.

8. How many square feet are there in the top of a table 2 ft. by 4 ft.?

9. How many square inches are there in a surface containing 3 sq. ft.?

10. 288 sq. in. = —— sq. ft.   **12.** 27 sq. ft. = —— sq. yd.

11. 5 sq. ft. = —— sq. in.   **13.** 5 sq. yd. = —— sq. ft.

1. Write the days of the week and the months of the year, with their abbreviations.

2. Observe that the **second hand** moves over 60 small or second spaces, while the minute hand moves over one minute space.
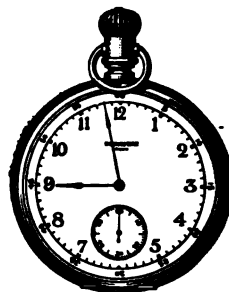
3. Memorize this table :

> **60 seconds (sec.)= 1 minute (min.)**
> **60 minutes = 1 hour (hr.)**
> **24 hours = 1 day (da.)**
> **365 days = 1 year (yr.)**

September, November, April, and June have 30 days each. All the other months except February have 31 days each. February usually . has 28 days. A year that has 366 days is called a **leap year.** In leap year February has 29 days.

4. Memorize this rime :

Thirty days have September,
April, June, and November.
All the rest have thirty-one,
Save February, which alone
Has twenty-eight; and one day more
We add to it one year in four.

Change:

5. 3 min. to sec.

6. 6 da. to hours.

7. 7 hr. to minutes.

8. 3 da. 6 hr. to hr.

9. 10 wk. 6 da. to da.

10. How many days are there in April, May, and June ? in November, December, and January ?

1. Name the months in the year that have 28 days; 29 days; 30 days; and 31 days.

2. John has 15 minutes of recess in the morning, 15 minutes in the afternoon, and 1 hour at noon. How many minutes of recess has he in all?

3. Mary studies 40 minutes each evening for 6 nights a week. How many minutes does she study during the week? how many hours?

4. Alfred works 30 minutes each day in his school garden. How many minutes does he work in 6 days? how many hours?

5. Add in minutes $\frac{1}{4}$ hr. and $\frac{1}{2}$ hr.

6. Susan helps her mother 15 minutes in the morning and 20 minutes in the evening. How many minutes does she help each day?

7. Clyde averages 30 minutes in home study for 180 school days. How many hours of home study does he average?

8. A hammer makes 2 strokes each second. How many strokes does it make in a minute?

9. William gets a book from the library which is to be returned June 16. The book is returned June 30 with a charge of 2¢ a day for overtime. How much does William pay?

10. Maud retires at 8.40 P.M. and rises at 6.40 A.M. How many hours is she in bed?

1. Name some articles bought by the **ounce**; by the **pound**.

2. How many ounces are there in 1 pound? in 10 pounds?
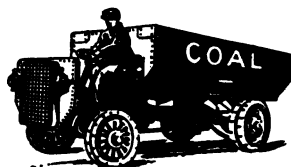
Coal, hay, sand, plaster, etc., in large quantities, are sold by the **ton** of 2000 **pounds**.

3. Memorize this table:

> **16 ounces (oz.) = 1 pound (lb.)**
> **2000 pounds = 1 ton (T.)**

4. How many pounds of coal are there in 8 tons? in 7 tons? in 12 tons?

5. Find the number of tons and pounds in 7460 lb. of ice.

6. A freight car carries 60,000 pounds of freight. How many tons does it carry?

7. A dealer buys 150 bales of hay, averaging 90 pounds to the bale. How many tons and pounds over does he buy?

8. 32 oz. = —— lb.   **12.** 4000 lb. = —— T.

9. 64 oz. = —— lb.   **13.** 8000 lb. = —— T.

10. 5 lb. = —— oz.   **14.** 5 T. = —— lb.

11. 4 lb. = —— oz.   **15.** 10 T. = —— lb.

1. At 3 cents an ounce, how much does 1 pound of mustard cost?

2. 2 tons of rolled oats were packed in pound packages. How many packages were there?

3. A load of hay weighed 4000 pounds. How many tons did it weigh?

4. Find the weight of 20 kegs of nails, each weighing 100 lb.

5. A man delivered 3 tons of coal in bags containing 100 lb. each. How many bags of coal were there?

6. How much do 16 lb. prunes cost at 12ȼ a pound?

7. How many ounces of butter are there in 24 lb.?

8. How much do 18 lb. butter cost at 48ȼ a pound?

9. John's father got a coal bill for 6500 lb. of soft coal. How many even tons and pounds over had he bought?

10. How many pounds are there in 3 tons? in 5 tons? in 8 tons?

11. William sold 340 eight-pound baskets of grapes. How many tons and pounds over did they make?

12. How many 2-ounce packages of ginger could be sold from 10 lb. 10 oz. of ginger?

13. John weighed 101 lb. 9 oz.; and James 111 lb. 10 oz. How many ounces more did James weigh than John?
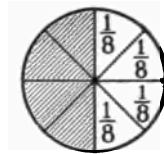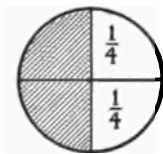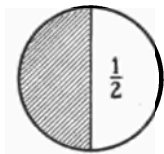
1. $\frac{1}{2} = \frac{?}{4} = \frac{?}{8}$

2. $\frac{1}{2} + \frac{1}{2} = \frac{?}{2}$

3. $\frac{1}{4} + \frac{2}{4} = \frac{?}{4}$

4. $\frac{1}{4} + \frac{1}{2} = \frac{?}{4}$

5. $\frac{2}{4} = \frac{?}{8}$

6. $\frac{2}{8} + \frac{2}{8} = \frac{?}{8}$

7. $\frac{4}{4} = \frac{?}{8}$

8. $\frac{2}{2} = \frac{?}{8}$

9. $\frac{4}{8} = \frac{?}{4}$

10. $\frac{6}{8} = \frac{?}{4}$

Draw two lines of equal length. Divide one into fourths and the other into eighths. Refer to them in answering the following:

11. Which is greater, $\frac{2}{4}$ or $\frac{3}{8}$? How much greater is it?

12. How much greater is $\frac{1}{4}$ than $\frac{1}{8}$?

13. Compare $\frac{3}{4}$ with $\frac{3}{8}$; $\frac{1}{2}$ with $\frac{1}{4}$.

14. From $\frac{4}{8}$ subtract $\frac{1}{4}$.

15. Compare $\frac{6}{8}$ with $\frac{3}{4}$.

16. How much is 3 times $\frac{1}{4}$?

17. How many times must $\frac{1}{8}$ be taken to make $\frac{1}{2}$? to make $\frac{1}{4}$?

18. If you cut $\frac{1}{2}$ of a yard from $\frac{3}{4}$ of a yard of ribbon, how much ribbon will be left?

1. $\frac{1}{2}$ qt. = —— pt.

2. $\frac{1}{4}$ gal. = —— qt.

3. $\frac{1}{8}$ pk. = —— qt.

4. $\frac{1}{2}$ lb. = —— oz.

5. $\frac{1}{2}$ hr. = —— min.

6. $\frac{1}{4}$ hr. = —— min.

7. $\frac{1}{8}$ da. = —— hr.

8. $\frac{1}{2}$ doz. = ——

9. $\frac{1}{4}$ doz. = ——

10. $\frac{1}{2}$ gal. = —— qt.

11. $\frac{1}{2}$ min. = —— sec.

12. $\frac{1}{4}$ da. = —— hr.

13. $\frac{1}{4}$ pk. = —— qt.

14. $\frac{1}{4}$ lb. = —— oz.

15. $\frac{1}{8}$ lb. = —— oz.

16. $\frac{1}{2}$ mi. = —— ft.

17. $\frac{1}{2}$ mi. = —— rd.

18. $\frac{1}{2}$ sq. ft. = —— sq. in.

19. $\frac{1}{4}$ mi. = —— ft.

20. $\frac{1}{8}$ mi. = —— ft.

21. If each of three children receives $\frac{1}{4}$ of a pound of candy, how much do they all receive?

22. If I study my lessons $\frac{3}{4}$ hr., how many minutes do I study?

23. Ruth has $\frac{5}{8}$ of a yard of silk. She cuts off $\frac{1}{2}$ yard for a doll's dress. How much is left?

24. How much lace is there in 2 remnants, one of which measures $\frac{1}{2}$ yd. and the other $\frac{1}{4}$ yd.?

25. Find the cost of $\frac{1}{2}$ qt. of milk at 14 ⊄ a quart.

26. How much must I pay for $\frac{1}{4}$ doz. buttons at 12 ⊄ a dozen?

27. At 80 ⊄ a pound find the cost of $\frac{1}{4}$ lb. of tea.

The Junior Red Cross

1. How much is the Red Cross School Fund in a school that enrolls 240 members in the Junior Red Cross, and collects $1 from each 4 members?

2. In a town where the school attendance was 2340, $\frac{1}{3}$ of the pupils joined the Junior Red Cross. How many members were there?

3. In one large city the school children made 17,122 refugee and hospital garments, 347 sweaters, 42 scarfs, 210 wristlets, 216 socks, 29 helmets, 25 caps, and 350 wash cloths. Find the total number of articles made by these children.

4. Some of the children made cotton pads of gauze 18 inches by 12 inches. How many square inches of gauze were there in each pad?

5. In one school the children made 296 comfort kits at a cost of $2 each. Find the total cost.

6. Two schools gave entertainments for their Red Cross Fund. One earned $283.52, and the other $194.78. How much more did the first earn than the second?

7. In the state of New York, 241,980 children representing 545 schools were enrolled in the Junior Red Cross. What was the average enrollment for each school?

Multiply five of these examples in one minute:

By 9		By 7		By 8		By 6	
1.	2467	6.	6935	11.	6238	16.	6294
2.	3258	7.	9186	12.	1459	17.	7386
3.	9614	8.	2734	13.	9345	18.	9281
4.	2836	9.	8567	14.	2764	19.	4936
5.	9205	10.	2137	15.	3285	20.	9275

Divide four of these examples in one minute:

By 8		By 9		By 7		By 6	
21.	8143	25.	8769	29.	8637	33.	8425
22.	2695	26.	2893	30.	2049	34.	6439
23.	7378	27.	6241	31.	9267	35.	9375
24.	6291	28.	7083	32.	7328	36.	8162

Spinning the Arrow

Make a circle of cardboard. Place numbers from 0 to 12, omitting 1, at regular intervals around the circumference. Fasten an arrow loosely in the center. Each child spins the arrow, multiplies the number to which the arrow points by a given number, and adds the number opposite the arrow. For example, one child spins, multiplies the indicated number (say 9) by 6, and adds 8; another child spins, multiplies 12 by 8, and adds 2.
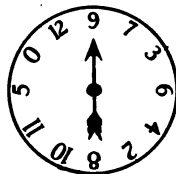
Find how long it takes you to get the *right answers* to each set of five examples.

I

1. $462 \times 306 = ?$
2. Write in words 387,642.
3. $\$126 - \$.87 = ?$
4. $8370 \div 77 = ?$
5. Find $\frac{1}{8}$ of 6472.

II

1. $\$800 - \$786.47 = ?$
2. Divide 2543 by 74.
3. Which is greater, $\frac{3}{4}$ or $\frac{7}{8}$?
4. $782 \times 700 = ?$
5. $9450 \div 86 = ?$

III

1. Write in figures one hundred thousand.
2. Subtract 3847 from 9600.
3. $66,800 \div 71 = ?$
4. Show $\frac{4}{5}$ of a line.
5. $876 \times 290 = ?$

IV

1. How much greater is 3645 than 2709?
2. $647 \times 316 = ?$
3. $33,075 \div 82 = ?$
4. Find $\frac{1}{9}$ of 1089.
5. Write in figures seven thousand six.

V

1. $\$364 - \$297.68 = ?$
2. $74,937 \div 807 = ?$
3. $120 \times \$6384 = ?$
4. Write in words 600,710.
5. Find $\frac{1}{8}$ of 816.

VI

1. Write in figures nine thousand nine.
2. $964 - 789 = ?$
3. $42,164 \div 221 = ?$
4. $\frac{1}{2} - \frac{1}{4} = ?$
5. $207 \times \$300 = ?$

LIBERTY BOND
SALES
FIRST WEEK 915,050
SECOND WEEK 2,854,650
THIRD WEEK 7,005,000

CHAPTER VI

READING AND WRITING NUMBERS

1. What is the largest number that can be written with six figures?

One thousand thousand is called **one million** and is written 1,000,000. 20 million is written 20,000,000. 500 million is written 500,000,000.

MILLIONS' PERIOD			THOUSANDS' PERIOD			UNITS' PERIOD		
Hundred-millions	Ten-millions	Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Ones
1	0	2,	0	5	6,	4	0	5

This number is read *102 million, 56 thousand, 405.*

2. Read the numbers in the picture.

Read and then write from dictation:

3. 49,608   5,077,470   35,378,429   391,370,605

4. 999,999   6,960,000   69,091,404   225,400,204

181

Read; then write from dictation:

	a	b	c
	a	*b*	*c*
1.	$647.84	$100,000.00	3,648.98
2.	$2,967.20	$25,647.29	$2,280.47
3.	$3,004.05	$19,614.18	$35,470.90
4.	$23,764.00	$237,412.10	$3,645.32

Read the following large numbers:

5.	2,346,521	40,056,019	225,643,142
6.	5,005,203	75,503,002	421,095,010
7.	4,500,600	94,000,501	950,500,000
8.	7,095,008	83,050,000	600,000,578

Write in figures:

9. Three million fifty thousand two hundred.

10. Sixty million one thousand eighty-nine.

11. Nine hundred million five thousand four.

12. Read: We must provide 19,550,000 tons of food in 1919, to feed 200,000,000 people abroad.

13. Write the first twelve Roman numbers.

14. Learn the following Roman numbers:

XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
13	14	15	16	17	18	19	20
XXX	XL	L	LX	LXX	LXXX	XC	C
30	40	50	60	70	80	90	100

15. Write the Roman numbers for:

18   19   34   46   57   65   79   82   93   100

16. Read:

XXXIX   XLI   LXII   LXXXI   XCI   LXXIV

Add, writing the answers on a piece of paper placed beneath the examples. Try to find the sums of four examples in 1½ minutes:

	a	b	c	d
1.	$ 751.04	$ 146.80	$ 345.75	$ 4187.90
	690.20	12.96	187.60	64.72
	404.72	842.90	962.45	124.87
	812.42	950.45	878.72	2671.82
	900.25	2.75	964.54	48.96
	10.48	24.87	12.68	702.84
2.	$964.77	$420.41	$862.41	$3864.12
	844.76	703.45	742.87	246.98
	99.75	802.60	368.23	107.64
	184.65	12.87	467.28	963.66
	209.87	908.72	643.82	5478.23
	84.72	885.88	782.95	682.87
	104.88	225.12	328.15	478.24
	84.91	380.96	841.62	332.85
3.	$844.62	$642.83	$321.62	$2891.42
	256.48	469.27	41.68	117.68
	741.87	184.64	769.62	49.64
	369.73	926.48	186.47	961.41
	108.42	12.93	524.93	87.83
	957.68	193.67	834.71	113.22
	87.64	446.72	221.34	6487.64
	123.96	689.38	455.26	923.06

Copy, subtract, and test four examples in $2\frac{1}{2}$ minutes :

	a	b	c	d
1.	$843.87	$376.47	$2498.73	$48,892.00
	632.17	248.02	519.71	15,079.63
2.	$600.01	$246.91	$7739.82	$32,171.19
	289.81	19.17	7015.09	16,593.40
3.	$940.09	$897.63	$9999.86	$45,269.79
	16.41	600.75	1305.17	27,319.27
4.	$632.25	$741.20	$5020.37	$37,461.27
	245.19	523.18	2456.78	19,842.07
5.	$395.33	$461.05	$3649.08	$27,004.49
	49.27	37.97	500.16	19,017.63
6.	$582.36	$679.87	$4532.98	$75,009.75
	19.36	27.93	403.61	69,135.92
7.	$780.16	$665.32	$8763.55	$97,382.99
	25.31	413.27	6300.01	39,853.75
8.	$867.35	$751.27	$5983.27	$32,148.91
	759.32	427.75	2742.19	14,269.90
9.	$990.00	$886.95	$9836.92	$33,197.84
	537.17	214.75	4775.48	19,057.55

1. Multiply $1.25 by 3.   In multiplying dollars
and cents, place the decimal

$1.25
 3

$3.75 = **375¢**

point in the product *directly*
under the decimal point in
the multiplicand.   Write
the dollar sign before the number of dollars.

2. Multiply 70¢ by 3.   **3.** Multiply $.75 by 4.

70¢		$.75	
3		4	
210¢ = $2.10		$3.00 = 300¢	

Multiply :

	a	b	c	d	e
4.	$3.50	$3.05	$6.05	$9.40	$7.04
	2	4	3	5	4
5.	$.60	$.08	74¢	49¢	95¢
	5	3	4	5	5

6. How much do 3 baskets of peaches cost at $.65
a basket?

7. A messenger boy delivers 4 messages at $.45
each.   How much does he earn for his company?

8. If Mary earns $9.75 a week in a department
store, find her wages for 4 weeks.

9. At $1.50 apiece, find the cost of 6 tickets for a
concert.

10. Find the cost of 6 railroad tickets at $4.68 each.

Household Purchases

Eggs, $.48 a dozen	Cheese, $.28 a pound
Nut butter, $.32 a pound	Coffee, $.28 a pound
Apples, $4.65 a barrel	Tomatoes, $.75 a crate
Flour, $10 a barrel	Oranges, $.45 a dozen

At the above price how much must I pay for each of the following purchases?

1. 8 dozen eggs.
2. 7 pounds of cheese.
3. 4 barrels of apples.
4. 12 pounds of coffee.
5. 6 crates of tomatoes.
6. 2 barrels of flour.
7. 9 pounds of butter.
8. 16 pounds of butter.
9. 4 dozen eggs and 2 pounds of butter.
10. 1 barrel of flour and 3 crates of tomatoes.
11. 2 dozen oranges and 2 dozen eggs.

The following represent the daily purchases of certain provisions by hotels. Find how much is paid in 7 days; in 10 days; in 24 days; in 236 days.

	a	b	c	d
12.	$ 4.27	$ 6.18	$ 7.00	$ 5.35
13.	$ 9.65	$ 37.25	$ .87	$ 6.75
14.	$ .48	$ 3.84	$ 6.95	$ 4.44
15.	$ .50	$ 9.50	$ 4.89	$ 9.99

16. Find the cost of 2 dozen chairs at $ 2.75 each.

17. It requires 40 yards of carpet for a certain room. How much will it cost at $ 2.98 a yard?

In the Trolley Car

1. How many seats are there on each side of the car?

2. When 8 seats were vacant on each side, how many were occupied?

3. The conductor collected 75 fares on the first trip and 87 fares on the return trip. How many fares did he collect?

4. The fare was 5 cents. How much money did he collect on both trips?

5. A lady paid for herself and 5 children. She gave the conductor a half dollar. How much change should she receive?

6. Each seat accommodated two persons. How many persons could be seated in the car?

7. The conductor earned $3.80 in a day. How much did he earn in 5 days?

8. The motorman earned $4.25 a day. How much did he earn in 5 days? How much more did he earn in a day than the conductor?

9. The line was 8 miles long. How far did a car run in making 5 round trips?

10. On one trip each seat was occupied, and 5 persons had to stand. Find the amount of the fares for the trip.
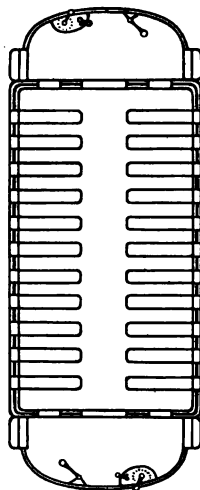
Numbers that name objects are **concrete**; as, 6 apples, 3 boys, 5 yards.

Numbers that do not name objects are **abstract**; as, 7, 9, 3.

1. Which of the following numbers are abstract? Which are concrete? 8; 6 eggs; $4; 5¢; 25; 4 feet.

2. Name the multiplier and the multiplicand:

$8	64 days	81 horses	72 oranges
5	4	7	3

The product has the *same* name as the multiplicand. *The multiplier is always an abstract number.*

When two numbers are multiplied, the *number in the product* remains the same in whatever order the numbers are taken; thus, $7 \times 12 = 12 \times 7$.

3. How much do I earn in 125 days at $3 a day?

When the multiplier has more figures than the multi-

125
3
375

plicand, the product may be found as at the left, but the explanation should be given thus:

In one day I earn $3.
In 125 days, I earn $125 \times $ 3, or $375.

Find the cost of:

4. 319 days' work at $3.

5. 817 tons coal at $9.

6. 198 lb. meal at 9¢.

How many:

7. Pints in 327 qt.?

8. Inches in 845 ft.?

9. Pecks in 164 bu.?

1. Into how many parts has this circle been divided? What is the name of each part? Into how many halves can any object be divided?
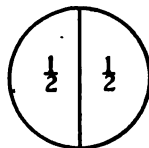
2. 1 half apple + 1 half apple = ? $\$.\frac{1}{2} + \$\frac{1}{2} = ?$

Find the sum of:

	a	b	c	d
3.	$1\frac{1}{2}$ gal.	$4\frac{1}{2}$ bu.	$5\frac{1}{2}$ yd.	$3\frac{1}{2}$ qt.
	3 gal.	$2\frac{1}{2}$ bu.	$4\frac{1}{2}$ yd.	$\frac{1}{2}$ qt.

4. Add:

$15\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2} = 1$; $1 + \frac{1}{2} = 1\frac{1}{2}$.

$9\frac{1}{2}$ Write the fraction $\frac{1}{2}$, and add 1 to the whole numbers.

$6\frac{1}{2}$

$\overline{31\frac{1}{2}}$

5. $4\frac{1}{2} + 27\frac{1}{2} + 3\frac{1}{2}$ 7. $11\frac{1}{2} + 25\frac{1}{2} + 42\frac{1}{2}$

6. $9\frac{1}{2} + 18\frac{1}{2} + 27\frac{1}{2}$ 8. $9 + 37\frac{1}{2} + 86\frac{1}{2}$

Insert the missing number. The number below the line is the sum.

	a	b	c	d	e	f
9.	$4\frac{1}{2}$	$7\frac{1}{2}$	$6\frac{1}{2}$	$8\frac{1}{2}$	$9\frac{1}{2}$	11
	?	?	?	?	?	?
	$\overline{10\frac{1}{2}}$	$\overline{15\frac{1}{2}}$	$\overline{7\frac{1}{2}}$	$\overline{12\frac{1}{2}}$	$\overline{18\frac{1}{2}}$	$\overline{20\frac{1}{2}}$

Subtract:

10.	$8\frac{1}{2}$	$4\frac{1}{2}$	$12\frac{1}{2}$	$11\frac{1}{2}$	$14\frac{1}{2}$	$62\frac{1}{2}$
	5	3	$10\frac{1}{2}$	$9\frac{1}{2}$	$7\frac{1}{2}$	37
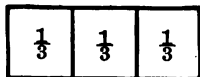
$\boxed{\frac{1}{3} \quad | \quad \frac{1}{3} \quad | \quad \frac{1}{3}}$ **1.** How many thirds are there in this oblong? How many thirds are there in one of anything? How many feet are there in 1 yard? What part of a yard is 1 foot? What part of a yard is 12 inches? How many thirds are there in 2 oranges?

Add:

2. $\frac{1}{3}+\frac{1}{3}=\frac{?}{3}$ $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}=\frac{3}{3}$, or 1 $\frac{2}{3}+\frac{2}{3}+\frac{2}{3}=\frac{6}{3}$, or 2

	a	b	c	d	e
3.	$4\frac{1}{3}$	$6\frac{2}{3}$	$5\frac{1}{3}$	$8\frac{1}{3}$	$9\frac{1}{3}$
	$2\frac{2}{3}$	$1\frac{1}{3}$	4	$5\frac{1}{3}$	$7\frac{2}{3}$
4.	$8\frac{1}{3}$	$7\frac{2}{3}$	$9\frac{1}{3}$	7	12
	$10\frac{1}{3}$	$6\frac{2}{3}$	5	$8\frac{2}{3}$	$8\frac{1}{3}$

Find the missing number. The number below the line is the sum.

5.	$8\frac{2}{3}$	$9\frac{1}{3}$	7	$15\frac{1}{3}$	$8\frac{2}{3}$
	?	?	?	?	?
	$11\frac{2}{3}$	$14\frac{2}{3}$	$12\frac{2}{3}$	$18\frac{2}{3}$	$11\frac{2}{3}$

Subtract:

6.	$7\frac{2}{3}$	$8\frac{2}{3}$	$9\frac{2}{3}$	$18\frac{2}{3}$	$17\frac{2}{3}$
	3	$5\frac{1}{3}$	$4\frac{2}{3}$	$5\frac{2}{3}$	$9\frac{2}{3}$

7. I rubbed out $2\frac{2}{3}$ inches from a line $5\frac{2}{3}$ inches long. How long was the part remaining?

1. Into how many parts has the square been divided? Give the name of each part. What is the difference between a quarter of $1 and a fourth of $1? Into how many fourths can any object be divided?

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} =$ how many fourths? $\frac{3}{4}$ gal. + $\frac{1}{4}$ gal. = ?

Find the sums:

2. $2\frac{1}{4}$ + $\frac{3}{4}$ **4.** $6\frac{1}{4}$ gal. + $\frac{3}{4}$ gal.   **6.** $8\frac{1}{4}$ bu. + $\frac{3}{4}$ bu.

3. $6\frac{1}{4}$ + $\frac{1}{4}$ **5.** $3\frac{1}{4}$ pk. + $2\frac{2}{4}$ pk.   **7.** $7\frac{3}{4}$ hr. + $1\frac{1}{4}$ hr.

Add:

	a	b	c	d	e	f
8.	$2\frac{1}{4}$	$6\frac{2}{4}$	$5\frac{1}{4}$	$3\frac{1}{4}$	$10\frac{2}{4}$	$12\frac{1}{4}$
	$3\frac{2}{4}$	$7\frac{3}{4}$	$6\frac{1}{4}$	$8\frac{1}{4}$	$7\frac{3}{4}$	9
	$5\frac{1}{4}$	$8\frac{3}{4}$	$25\frac{1}{4}$	$9\frac{1}{4}$	$8\frac{3}{4}$	$8\frac{3}{4}$
9.	11	$18\frac{3}{4}$	$19\frac{1}{4}$	$\frac{3}{4}$	$5\frac{1}{4}$	$20\frac{1}{4}$
	$14\frac{1}{4}$	$16\frac{2}{4}$	8	$\frac{3}{4}$	$6\frac{3}{4}$	8
	$27\frac{1}{4}$	$21\frac{3}{4}$	$62\frac{3}{4}$	$\frac{2}{4}$	17	$31\frac{3}{4}$

Complete:

10. $4\frac{1}{4} + ? = 9\frac{3}{4}$ **12.** $6\frac{1}{4} + ? = 11\frac{1}{4}$ **14.** $? + 8\frac{1}{4} = 15\frac{1}{4}$

11. $6\frac{3}{4} + ? = 8\frac{3}{4}$ **13.** $9\frac{3}{4} + ? = 13\frac{3}{4}$ **15.** $? + \frac{1}{4} = 6\frac{2}{4}$

Find the differences:

16. $8\frac{1}{4} - 7$ **19.** $9\frac{3}{4} - 8\frac{1}{4}$ **22.** $19\frac{3}{4} - 7\frac{1}{4}$

17. $16\frac{3}{4} - 5\frac{1}{4}$ **20.** $16\frac{1}{4} - 7\frac{1}{4}$ **23.** $16\frac{1}{4} - 8$

18. $23\frac{3}{4} - 7\frac{3}{4}$ **21.** $12\frac{2}{4} - 11\frac{1}{4}$ **24.** $14\frac{1}{4} - 7$
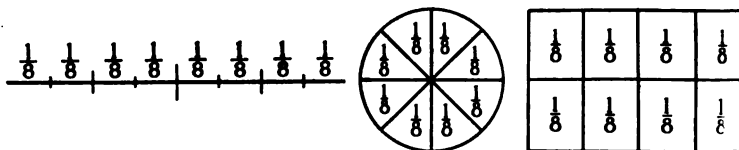
1. Into how many eighths can any whole unit be divided?

2. Compare $\frac{1}{2}$ of a unit and $\frac{4}{8}$ of a unit.

3. Compare $\frac{2}{4}$ of a unit and $\frac{4}{8}$ of a unit.

4. $\frac{2}{8} + \frac{1}{8} = \frac{?}{8}$.

5. $\frac{1}{8}$ is what part of $\frac{1}{4}$?

6. $\frac{6}{8} - \frac{3}{8} = \frac{?}{8}$.

Add:

7. $3\frac{1}{8}$	**8.** $7\frac{3}{8}$	**9.** $6\frac{1}{8}$	**10.** $9\frac{1}{8}$	**11.** $5\frac{3}{8}$
$3\frac{1}{8}$	$8\frac{1}{8}$	$7\frac{1}{8}$	11	$12\frac{1}{8}$
$4\frac{1}{8}$	$9\frac{1}{8}$	$9\frac{2}{8}$	$6\frac{1}{8}$	$3\frac{1}{8}$

12. $\frac{3}{4} + \frac{2}{4} + \frac{3}{4} = \frac{8}{4}$, or 2 whole units; $\frac{3}{8} + \frac{7}{8} + \frac{6}{8} =$ how many whole units?

Subtract; then add:

13. $10\frac{3}{8}$	**14.** $12\frac{3}{8}$	**15.** $27\frac{4}{8}$	**16.** $19\frac{2}{8}$	**17.** $36\frac{4}{8}$
$5\frac{2}{8}$	$6\frac{1}{8}$	$8\frac{3}{8}$	$6\frac{1}{8}$	$16\frac{3}{8}$

18. $62\frac{5}{8}$	**19.** $63\frac{3}{8}$	**20.** $26\frac{4}{8}$	**21.** $18\frac{3}{8}$	**22.** $40\frac{3}{8}$
$31\frac{1}{8}$	$39\frac{1}{8}$	$24\frac{3}{8}$	$9\frac{3}{8}$	$20\frac{1}{8}$

1. Mary made a dress for herself, using $5\frac{1}{2}$ yards of cloth for the skirt and $2\frac{1}{2}$ yards for the waist. How many yards did she use for both?

2. Martha made $8\frac{1}{2}$ gallons of lemonade for a fair and sold 7 gallons. How much was unsold?

3. A dealer sold $2\frac{1}{4}$ tons of coal at one time and $3\frac{3}{4}$ tons at another time. How many tons did he sell?

4. From a barrel containing $31\frac{1}{2}$ gallons, 25 gallons were sold. How many gallons remained?

5. A dairyman sold in one month $1875\frac{1}{2}$ gallons of milk. He sold 250 gallons less the next month. How much did he sell the second month?

6. A farmer dug potatoes as follows: 23 bu., $24\frac{1}{2}$ bu., and $11\frac{1}{2}$ bu. How many bushels did he dig?

7. After he had sold $56\frac{1}{2}$ bu. of the potatoes, how many bushels had he left?

8. A stick $18\frac{2}{3}$ in. long was cut into two parts. One part was $7\frac{2}{3}$ in. long. How long was the other part?

9. Arthur's father owned $30\frac{1}{2}$ acres of land. He sold all but $24\frac{1}{2}$ acres at \$48 an acre. How much did he receive for the part sold?

10. Find the weight of 4 cakes of ice containing $35\frac{1}{2}$ lb., 18 lb., $22\frac{1}{2}$ lb., and 16 lb.

11. Find the distance around a room that is $18\frac{1}{8}$ ft. long and 16 ft. wide.

In the Schoolroom

1. This schoolroom is 28 feet wide and 32 feet long. What is the distance around it?

2. The glass in each window cost $ 2.50. How much was paid for all the glass?

3. Each desk cost $ 3.25. Find the cost of the desks in each long row.
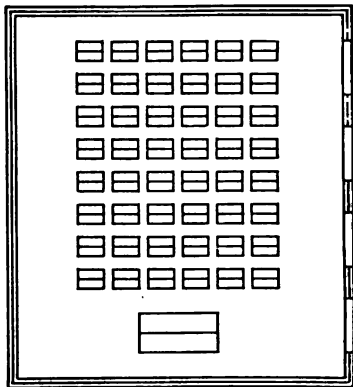
4. Find the value of the desks in the 6 rows.

5. The attendance for the first 8 school days was as follows: 36, 43, 42, 43, 37, 41, 43, 43. What was the average attendance?

NOTE. To find the average add the eight numbers and divide the sum by 8.

6. Eight tons of coal were used during the term. How much was paid for the coal at $ 8.50 a ton?

7. What was the amount of the teacher's salary for 8 months, at $ 70 a month?

8. Find the entire cost of:

48 Advanced Geographies at $ 1.00 each.
48 Primary Geographies at $ .45 each.
48 Grammars at $ .50 each.
48 Language Lessons at $ .35 each.
48 Readers at $ .48 each.

1. Find $\frac{2}{3}$ of 24.

$\frac{1}{3}$ of **24** = **8**;

$\frac{2}{3}$ of **24** = **2** × **8, or 16.**

How do we find $\frac{1}{3}$ of a number? $\frac{2}{3}$ of a number = $2 \times \frac{1}{3}$ of the number.

Give rapidly:

2. $\frac{1}{2}$ of each number: 16, 24, 36, 44, 48, 50.

3. $\frac{1}{3}$ and $\frac{2}{3}$ of each number: 15, 18, 21, 36, 45.

4. $\frac{1}{4}$ and $\frac{3}{4}$ of each number: 16, 20, 28, 32, 48.

5. $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, and $\frac{4}{5}$ of each number: 20, 35, 45, 40, 80.

Find:

6. $\frac{1}{3}$ of 27   12. $\frac{2}{3}$ of 27   18. $\frac{2}{3}$ of 33   24. $\frac{2}{3}$ of 75

7. $\frac{1}{3}$ of 24   13. $\frac{3}{4}$ of 36   19. $\frac{3}{4}$ of 40   25. $\frac{2}{5}$ of 75

8. $\frac{1}{2}$ of 26   14. $\frac{1}{7}$ of 56   20. $\frac{2}{5}$ of 60   26. $\frac{3}{4}$ of 96

9. $\frac{1}{2}$ of 42   15. $\frac{1}{8}$ of 64   21. $\frac{7}{8}$ of 24   27. $\frac{1}{2}$ of 144·

10. $\frac{2}{3}$ of 51   16. $\frac{1}{9}$ of 63   22. $\frac{2}{5}$ of 65   28. $\frac{3}{5}$ of 160

11. $\frac{3}{5}$ of 25   17. $\frac{2}{3}$ of 63   23. $\frac{5}{6}$ of 48   29. $\frac{4}{5}$ of 255

Find:

30. $\frac{2}{3}$ of $39   36. $\frac{3}{4}$ of 12 lb.   42. $\frac{1}{2}$ of $8.20

31. $\frac{3}{4}$ of $24   37. $\frac{2}{3}$ of 9 ft.   43. $\frac{1}{3}$ of $12.60

32. $\frac{1}{2}$ of $56   38. $\frac{1}{3}$ of 12 yd.   44. $\frac{1}{4}$ of $20.40

33. $\frac{2}{3}$ of $42   39. $\frac{3}{4}$ of 52 gal.   45. $\frac{1}{3}$ of $15.90

34. $\frac{3}{4}$ of $44   40. $\frac{3}{4}$ of 8 bu.   46. $\frac{1}{4}$ of $24.20

35. $\frac{5}{6}$ of $60   41. $\frac{7}{8}$ of 80 mi.   47. $\frac{3}{10}$ of $100

The sign @ followed by a price means " at " so much a unit. Thus, " 3 lb. steak @ $.40 " means " 3 lb. steak *at* $.40 *a pound;* " " 6 doz. buttons @ $.20 " means " 6 doz. buttons *at* $.20 *a dozen*."

Find the cost of:

1. 3 lb. lard @ $.32.

2. 6 doz. eggs @ $.48.

3. 5 sheep @ $4.75.

4. 6 bureaus @ $7.75.

5. 6 cows @ $80.

6. 6 rugs @ $4.75.

7. 6 lb. cornmeal @ $.04.

8. 5 cans tomatoes @ $.12.

9. 6 hats @ $1.25.

10. 5 books @ $1.75.

11. 6 lamps @ $1.33.

12. 6 wagons @ $85.

13. Multiply 16 by $2\frac{1}{2}$.   SHORT FORM

$$\begin{array}{r} 16 \\ 2\frac{1}{2} \\ \hline \end{array}$$

$\frac{1}{2}$ of $16 = 8$

$2 \times 16 = 32$

$2\frac{1}{2} \times 16 = 40$

$2\frac{1}{2}$ times 16 means that $\frac{1}{2}$ of 16 is to be added to 2 times 16.

$$\begin{array}{r} 16 \\ 2\frac{1}{2} \\ \hline 8 \\ 32 \\ \hline 40 \end{array}$$

Find the cost of:

14. $8\frac{1}{2}$ gal. oil @ $.12.

15. $6\frac{1}{4}$ pk. potatoes @ $.48.

16. $8\frac{1}{4}$ yd. silk @ $1.20.

17. $7\frac{1}{2}$ yd. lace @ $.16.

18. $6\frac{1}{4}$ doz. bananas @ $.24.

19. $6\frac{1}{2}$ doz. buttons @ $.54.

20. $7\frac{1}{2}$ doz. buttons @ $.36.

21. $9\frac{1}{3}$ hours' work @ $.18.

22. $8\frac{1}{4}$ lb. butter @ $.48.

23. $6\frac{1}{2}$ yd. ribbon @ $.16.

24. $7\frac{1}{4}$ pk. peaches @ $.60.

25. $3\frac{1}{8}$ yd. muslin @ $.16.

1. Divide 7284 by 600.

6̸0̸0̸)728̸4̸
12 ; r. 84

The number 84, cut off from the dividend, forms the remainder.

2. Divide 9754 by 800. ·

8̸0̸0̸)975̸4̸
12 ; r. 154

$97 \div 8 = 12$, with a remainder of 1 (hundred). The complete remainder is therefore 154.

3. Divide 48,525 by 2300.

21 ; r. 225
23̸0̸0̸)4852̸5̸
    46
   ――
    25
    23
   ――
   225

$485 \div 23 = 21$, with a remainder of 2 (hundreds). Bring down the number 25 to form the complete remainder, 225.

Divide :

4. 76,856 by 2200

5. 86,040 by 3100

6. 86,075 by 2500

7. 40,673 by 3200

8. 87,604 by 2300

9. 68,025 by 4200

10. 56,078 by 2400

11. 70,642 by 4100

12. 47,630 by 5100

13. 85,763 by 1300

Find the quotients :

14. $869,325 \div 463$

15. $739,186 \div 956$

16. $293,869 \div 409$

17. $891,382 \div 786$

18. $632,007 \div 817$

19. $283,756 \div 268$

20. $873,700 \div 945$

21. $586,138 \div 715$

22. $938,004 \div 807$

23. $139,287 \div 800$

Little Carpenters

1. The drafting room is 24 feet wide and 28 feet long. What is the distance around the room?

2. There are 7 stands in the room. Each one costs $5.50. What is the cost of all?

3. Each stand requires a " T " square, angles, scale, erasers, thumb-tacks, etc. The instruments cost $28. What is the average cost of instruments for each stand?

4. The first class works 40 minutes on Monday and Friday of each school week. How many minutes are spent by the class during 4 school weeks?

5. Each of 7 boys requires a drafting board costing $.59; ink, paper, pencils, etc., costing $.25. What is the cost of these materials for the class?

6. The boys make 2 chairs valued at $8.75 each, 3 stands at $3.25 each, and 4 book racks at $1.25 each. What is the value of all the articles?

The Cooking Class

1. It requires 4 yd. of material to make each of these girls an apron. How much is required for the class of 7 girls?

2. At $ .23 a yard for the material how much do 7 aprons cost?

3. From $9\frac{1}{2}$ yd. of lawn, how many caps, requiring $\frac{1}{2}$ yd. each, can be made? (Change to in.)

4. At $ .18 a yard, find the cost of lawn for sleeve protectors for 7 girls, each sleeve requiring $\frac{1}{2}$ yd.

5. How many pupils can be supplied with rolling pins and pie pans out of $9, if each pin costs $.20, and each pan $ .10?

6. Miss Dunn, the teacher, purchases the following: 7 flour cans @ $ .40, 7 cake pans @ $ .25, 7 sugar shakers @ $ .17. Find the amount of her purchases.

7. Entertaining the directors, this class uses 7 spring chickens @ $.70, 3 pounds of rice @ $.10, 1 head cabbage @ $ .08, 2 boxes tomatoes @ $.15, $\frac{1}{2}$ lb. butter @ $.48, 1 pt. cream @ $.24, and $\frac{1}{2}$ gallon ice cream @ $1.50. How much does the dinner cost them?

Taking Photographs

1. George bought a camera costing $ 6.12 and 6 rolls of films for $.24 each. How much change did he receive from a $ 10 bill?

2. Each picture was 2 inches by $3\frac{1}{4}$ inches. What was the number of square inches in its surface?

3. The pictures were mounted on cardboard, with a margin of $\frac{1}{2}$ inch on each side. What was the length of the cardboard? the width? the number of square inches in the surface?

4. It cost $.18 to develop the roll of films. How much was this for each of the 6 exposures?

5. A roll of films having 6 exposures cost $.24, the developing for 6 exposures $.18, the printing of each picture $.03, and the mounting $.02. What was the total cost of each picture?

6. A picture $2\frac{1}{4}$ inches by $3\frac{1}{4}$ inches was mounted in the middle of a card $4\frac{3}{4}$ inches by $5\frac{3}{4}$ inches. How much margin was there on the card?

7. How large a card would be needed to mount a picture $6\frac{1}{2}$ inches by $8\frac{1}{2}$ inches, leaving a margin of $3\frac{1}{2}$ inches on each side?

Buying Groceries

Apples, $2.25 a bushel.	Eggs, 48 ¢ a dozen.
Peaches, good, $2.25 a bushel.	Nut butter, 28 ¢ a pound.
fancy, $2.50 a bushel.	Dairy butter, 50 ¢ a pound.
Pears, $1.50 a bushel.	Cheese, full cream, 30 ¢ a pound.
Grapes, Niagara, $1.20 a 10-lb. basket.	American, 25 ¢ a pound.
Concord, $1.25 a 10-lb. basket.	Potatoes, 50 ¢ a peck.

From the above prices find the cost of the following:

1. 8 bu. of fancy peaches.

2. $4\frac{1}{2}$ lb. of nut butter.

3. $5\frac{1}{2}$ pk. of potatoes.

4. 8 10-lb. baskets of Concord grapes.

5. 7 bu. of apples.

6. $4\frac{1}{2}$ cases of eggs, 30 dozen each.

7. 8 10-lb. baskets of Niagara grapes.

8. $8\frac{1}{2}$ pk. of potatoes.

9. 7 bu. of good peaches.

10. 9 full cream cheeses, 15 lb. each.

11. 7 10-lb. baskets of Concord grapes.

12. $9\frac{1}{2}$ bu. of pears.

13. 8 bu. of apples.

14. 7 lb. of dairy butter and 32 lb. of nut butter.

15. 8 bu. of fancy peaches and 42 bu., good quality.

16. 8 10-lb. baskets of Concord grapes, and 6 10-lb. baskets of Niagara grapes.

Find the products and test the answers:

	a	b	c
1.	$4 \times \$2.75$	$7 \times \$82.93$	$8 \times \$93.15$
2.	$5 \times \$3.86$	$8 \times \$46.25$	$9 \times \$73.86$
3.	$6 \times \$7.27$	$9 \times \$73.87$	$7 \times \$49.25$

4. Divide $6.15 by 3.

$$\begin{array}{r} 3)\$6.15 \\ \hline \$2.05 \end{array}$$
Divide $6.15 by 3, placing a *decimal point directly under* the decimal point in the dividend. Write the dollar sign before the number of dollars in the quotient.

Find the quotients and test:

	a	b	c
5.	$\$4.70 \div 2$	$\$6.76 \div 4$	$\$29.34 \div 9$
6.	$\$2.08 \div 2$	$\$8.22 \div 6$	$\$46.72 \div 8$
7.	$\$9.27 \div 3$	$\$9.05 \div 5$	$\$71.05 \div 7$

Find:

	a	b	c
8.	$\frac{1}{3}$ of $27.15	$\frac{1}{4}$ of $16.64	$\frac{1}{7}$ of $39.34
9.	$\frac{1}{2}$ of $18.24	$\frac{1}{5}$ of $26.70	$\frac{1}{8}$ of $97.68
10.	$\frac{1}{4}$ of $20.48	$\frac{1}{6}$ of $38.40	$\frac{1}{9}$ of $27.36

Perform the operations indicated:

11.	$\$273.84 \div 6$	$\$263.76 \div 8$	$\$375.42 \div 6$
12.	$5 \times \$936.25$	$9 \times \$423.96$	$\$495.67 \div 7$
13.	$6 \times \$475.83$	$\$928.14 \div 6$	$\$321.21 \div 9$
14.	$\$721.98 \div 9$	$\$743.68 \div 7$	$8 \times \$563.94$
15.	$\$435.76 \div 8$	$\$269.19 \div 9$	$6 \times \$732.75$

1. At $.25 each, how many thrift stamps can you buy for $6.25?

$6.25 = 625 ¢ $.25 = 25¢

Cost of 1 stamp, 25 ¢)625¢, Money spent

  25, Number of stamps
  50
  ───
  125
  125

2. Richard's father lent him $50 for a Liberty bond. Richard paid back $.50 a week. How many weeks did it take him to pay for the bond?

3. Mrs. Elsen paid 45 cents a pound for butter for her boarding house. The amount of her bill was $5.40. How many pounds did she buy?

4. Ruth bought silk at $1.25 a yard and paid $12.50. How many yards did she buy?

5. The manager of a hotel paid $17.28 for 24 dozen fresh-laid eggs. What was the price per dozen?

6. How many bars of iron, weighing 56 lb. each, are equal in weight to a bar weighing 18,200 lb.?

7. A man sold land for $45 an acre, receiving $7200 for it. How many acres did he sell?

8. An orchard contained 4032 trees, planted in 32 rows. How many trees were there in a row?

9. A farm of 174 acres was sold for $12,876. What was the selling price per acre?

10. Mother paid $4.40 for a turkey at 55¢ a pound. What was the weight of the turkey?

These problems should be worked by writing the answers directly, without placing the multiplier under the multiplicand.

Find the cost of :

1. 3 houses @ $2500.

2. 750 doz. buttons @ 30¢.

3. 60 hats @ $1.25.

4. 48 chairs @ $2.50.

5. 25 suits @ $10.

6. 6 qt. salad oil @ $.60.

7. 8 yd. silk @ $1.25.

8. 150 yd. linen @ $.30.

9. 12 lb. nut butter @ 25¢.

10. 25 doz. eggs @ 48¢.

11. 11 doz. lemons @ 30¢.

12. 15 pounds of lard @ 32¢.

13. 3 gal. maple sirup @ $3.25.

14. 3 hams @ $2.75.

Find the products :

15. $4 \times 30 =$

16. $10 \times 10 =$

17. $2 \times 25 =$

18. $5 \times 50 =$

19. $6 \times 60 =$

20. $8 \times 90 =$

21. $12 \times 50 =$

22. $11 \times 30 =$

23. $9 \times 25 =$

24. $10 \times 35 =$

25. $12 \times 12 =$

26. $12 \times 40 =$

27. $12 \times 15 =$

28. $12 \times 45 =$

Find the cost of 1 when :

29. 9 bbl. flour cost $90.

30. 12 doz. oranges cost $3.

31. 8 coats cost $48.

32. 4 sheep cost $22.

33. 15 lb. fish cost $3.

Find the quotients :

34. $360 \div 9 =$

35. $328 \div 8 =$

36. $455 \div 7 =$

37. $156 \div 12 =$

38. $121 \div 11 =$

Time yourself in working these examples.

Find the cost of :

1. 9 rings @ $3.
2. 12 desks @ $35.
3. 10 hats @ $3.65.
4. 10 bags @ $1.50.
5. 3 wagons @ $85.
6. 9 plates @ $1.75.
7. 10 knives @ $.75.
8. 10 vases @ $2.39.
9. 10 horses @ $95.
10. 11 books @ $2.25.
11. 11 rugs @ $4.75.
12. 10 chairs @ $5.25.
13. 6 chickens @ 75¢.
14. 12 pictures @ $4.50.

Find the cost of 1 when :

15. 12 lamps cost $51.
16. 4 cases cost $32.48.
17. 10 sleds cost $19.50.
18. 10 rugs cost $45.
19. 11 chairs cost $35.75.
20. 8 trunks cost $57.60.
21. 10 clocks cost $48.50.
22. 5 hats cost $15.
23. 12 hats cost $27.
24. 12 lb. rice cost 96¢.
25. 3 clocks cost $9.75.
26. 9 books cost $11.25.
27. 5 chairs cost $15.45.
28. 9 lb. nuts cost $2.25.
29. 8 lb. prunes cost $1.20.
30. 10 satchels cost $35.50.
31. 12 yd. lace cost 48¢.
32. 11 lb. meat cost $3.30.
33. 6 qt. vinegar cost 72¢.
34. 12 yd. silk cost $18.
35. 12 pk. tomatoes cost 84¢.
36. 10 toy engines cost $35.
37. 5 lb. meat cost $1.50.
38. 8 yd. cambric cost $1.60.
39. 4 bu. cherries cost $15.
40. 10 yd. silk cost $17.50.
41. 10 qt. milk cost $1.50.
42. 11 lb. butter cost $5.50.
43. 3 pairs shoes cost $9.75.
44. 12 collars cost $2.40.

Time yourself in working these examples.

Find the cost of :   Add :

1. $13\frac{1}{2}$ lb. of nut butter at 34 ¢ a pound.
2. 64 suits at $8¼ each.
3. 16 pairs of shoes at $4 a pair.
4. 400 lb. of cornmeal at 4 ¢ a pound.
5. 36 coats at $13.25 each.
6. 3000 envelopes at $12 a thousand.
7. 172 yd. of lace at 87 ¢ a yard.
8. 2500 lb. of coffee at 20 ¢ a pound.
9. 128 hogs at $20¼ each.
10. 37 hats at $2.25 each.
11. $45\frac{1}{2}$ yd. of linen at 80 ¢ a yard.
12. 1 gross pencils at 60 ¢ a dozen.
13. 32 cows at $82 each.
14. 125 tons of hay at $14.75 a ton.
15. 72 bbl. of flour at $10 a barrel.
16. 14 bolts of ribbon at 75 ¢ a bolt.
17. 78 bu. of corn at $1.25 a bushel.
18. $47\frac{1}{2}$ bu. of oats at 80 ¢ a bushel.
19. 25 yd. of linen at 50 ¢ a yard.
20. 25 lb. of fish at 25 ¢ a pound.
21. $2\frac{1}{2}$ doz. pairs of gloves at $1 a pair.
22. $36\frac{1}{2}$ yd. of lace at 18 ¢ a yard.
23. 2 gross penholders at 50 ¢ a dozen.

24. $463.75
     695.42
    1937.86
     947.75
     678.93
    ―――――

25. $6937.85
      596.27
     8346.39
      326.42
     2186.75
      495.38
    ―――――

26. $9612.73
      693.85
     2928.46
      478.74
     8569.93
      195.84
    ―――――

27. $3762.95
      661.43
       99.87
      875.67
      989.86
     4987.19
    ―――――

The process of finding how many times one number contains another, or of separating a number into equal parts, is called **division**.

1. How many times is $3 contained in $15?

This problem gives the *size* of the equal parts ($3) into which the dividend ($15) is to be divided, and asks for the *number* of equal parts. $15 ÷ $3 = 5, the *number* of equal parts.

2. What is the quotient of $15 divided by 3?

This problem gives the *number* of equal parts (3) into which the dividend ($15) is to be divided, and asks for the *size* of each part. $\frac{1}{3}$ of $15 = $5, the *size* of each part. This kind of division is called **partition**.

First state whether each problem calls for the *number* of equal parts or the *size* of each part, and then give answers:

3. 144 in. ÷ 12 in.   **7.** 192 bu. ÷ 16 bu.

4. 125 yd. ÷ 5   **8.** 108 in. ÷ 9

5. $132 ÷ $11   **9.** $\frac{1}{10}$ of $250

6. 150 ft. ÷ 10   **10.** $\frac{1}{8}$ of 128 da.

11. At $1.25 a bushel, how many bushels of corn will sell for $62.50?

12. If 28 buggies are sold for $2912, what is the average price?

13. If a train runs 1036 miles in 37 hours, how far will it run in one hour?

Buying Household Supplies

Potatoes, $2.25 a bushel. Beans, $4.25 a bushel. Butter, print, 55 ¢ a pound. dairy, 53 ¢ a pound. Sugar, 100-lb. bag, $8.50. Flour, $10 a barrel.	Corn, $1.25 a bushel. Baked beans, 95 ¢ a dozen cans. Celery, 10 ¢ a bunch. Eggplant, 75 ¢ a dozen. Watercress, 40 ¢ a dozen. Blackberries, $3.20 a crate.

At the prices above find the cost of each of the following :

1. 7 bu. potatoes.
2. 15 lb. print butter.
3. 30 bunches celery.
4. 25 doz. watercress.
5. 5 bu. beans.
6. 12 lb. dairy butter.
7. 8 bu. corn.
8. 10 bags sugar.
9. 25 bbl. flour.
10. 2 doz. cans baked beans.
11. 7 doz. eggplants.
12. 3 crates blackberries.

At $12\frac{1}{2}$ ¢ each find the cost of :

13. 72 yd. lace.
14. 144 books.
15. 64 vases.
16. 168 cups.
17. 256 yd. lawn.
18. 176 cards buttons.
19. 272 collars.
20. 128 yd. muslin.
21. 96 melons.
22. 152 yd. ribbon.

23. If 24 chairs cost $44.40, what is the price of 1 chair ?

24. James bought 10 lb. of sugar at 8 cents a pound; 4 lb. of nut butter at 30 cents a pound; 6 lemons at 3 cents apiece; and two 10-cent loaves of bread. How much was his bill ?

On the Farm

1. A farmer has 28 cows in three fields. If there are 12 in the first, and 9· in the second, how many cows are there in the third field?

2. The farmer values his cows at an average of $85 each. What is the value of all?

3. The fields over which they graze contain 24 acres, 18 acres, and 14 acres. How much grazing land is there, and what is the value of this land at $35½ an acre?

4. The farmer receives 21,560 gallons of milk a year. How much is it worth at 40 cents a gallon?

5. His Jersey cow yields 350 lb. of butter a year, which he sells at $.40 a pound. How much does he receive for it?

6. He sells 5 of the cows at an average price of $88.50. How much does he receive for them?

7. He keeps 2 men at $42½ a month each, to work on the farm. How much does the labor for the year cost?

8. He sells 14 calves for $560. How much does he receive, on an average, for each?

9. His grocery bill averages $36¼ per month. Find his bill for the year.

10. He purchases 2 horses, one at $325, and one at $350; and 2 wagons at $185 each. Repairs on the farm cost $87.50. Find the amount paid.

11. He buys 1½ doz. milk cans at $1.20 each. How much do they cost?

$$\boxed{\begin{array}{ll} \$.50 = \tfrac{1}{2} \text{ of } \$1.00 & \$.10 = \tfrac{1}{10} \text{ of } \$1.00 \\ \$.25 = \tfrac{1}{4} \text{ of } \$1.00 & \$.75 = \tfrac{3}{4} \text{ of } \$1.00 \end{array}}$$

Find by the shortest method the cost of:

1. 6 yards of linen at $.50 a yard.

SOLUTION. $6 \times \$\tfrac{1}{2} = \$\tfrac{6}{2} = \$3.$

2. 8 handkerchiefs at $.25 each.

3. 8 yards of ribbon at $.50 a yard.

4. 9 pounds of fish at $.25 a pound.

5. 10 doz. lemons at $.25 a dozen.

6. 9 yards of muslin at $.10 a yard.

7. 6 neckties at $.25 apiece.

8. 12 pictures at $.75 each.

9. 10 yards of lawn at $.10 a yard.

10. 5 gallons of vinegar at $.50 a gallon.

11. 9 yards of lace at $.50 a yard.

12. 10 dozen oranges at $.75 a dozen.

13. 6 pounds prunes at $.10 a pound.

14. 16 pounds of rice at $.10 a pound.

15. 12 bowls at $.25 each.

16. 7 dozen oranges at $.50 a dozen.

Change :

1. 60 ft. to yards.   7. 5 ft. to inches.

2. 28 rd. to feet.   8. 120 in. to feet.

3. 16 ft. to inches.   9. 72 ft. to yards.

4. 48 in. to feet.   10. 420 in. to feet.

5. 320 rd. to feet.   11. 1250 yd. to feet.

6. 1760 yd. to feet.   12. 120 rd. to feet.

13. How many feet of fence are required for a school garden in the form of an oblong 26 yards long and 12 yards wide?

14. James lives 180 rods from the schoolhouse. How many feet does he travel in going to and coming from school each day?

15. A boy travels 135 yards each day in carrying the mail. How many yards does he travel in 6 days? How much less than a mile does he travel?

16. Find the number of feet in 8 miles.

17. How many feet are there in 5 miles and 675 feet?

18. Change 2880 rods to miles.

19. John lives half a mile from the school. What is the distance in feet? What is the distance in rods?

20. How many feet are there in $1\frac{1}{2}$ miles?

21. Change 4 rods to feet; to yards.

Find the area in square inches of:

1. An oblong 4 in. by 6 in.   5. An 8-in. square.

2. A square 7 in. on each side.   6. A 12-in. square.

3. A page 5 in. by 8 in.   7. A 9-in. square.

4. A pad 10 in. by 12 in.   8. A 10-in. square.

9. Draw a figure to represent a book cover 3 in. wide and 5 in. long. Find its area. Find the distance around the oblong.

What is the distance around a figure called?

10. Find the perimeter, in inches, of each figure described in problems 1 to 9.

Let 1 inch stand for 1 foot and draw the following figures. Find their areas and their perimeters:

11. A 6-foot square.   13. A wall 6 ft. by 9 ft.

12. A rug 4 ft. by 9 ft.   14. A table 5 ft. by 6 ft.

Let 1 inch stand for 1 yard and draw the following figures. Find their areas and the perimeters:

15. A schoolroom 8 yd. wide and 10 yd. long.

16. A hall 3 yd. wide and 15 yd. long.

17. A sidewalk 2 yd. wide and 12 yd. long.

18. Matting for a room 4 yd. wide and 5 yd. long.

19. Measure, in even yards, the length and the width of your schoolroom floor, and draw the figure on a convenient scale.

1. Write each of the following under its proper measure: oil, cheese, oats, hay, beans, potatoes, coal, cloth, molasses, sugar, rice, the surface of the blackboard, the width of the room, the length of the blackboard.

Change:

2. 16 pt. to gallons.
9. 72 pk. to bushels.
3. 24 bu. to pecks.
10. 3750 yd. to feet.
4. 3 sq. ft. to sq. inches.
11. 24 in. to feet.
5. 17 yd. to feet.
12. 6 mi. to rods.
6. 120 ft. to inches.
13. 360 ft. to yards.
7. 50 lb. to ounces.
14. 4860 in. to feet.
8. 6 T. to pounds.
15. 6966 sq. ft. to sq. yd.

16. How many dozen oranges, and how many over, are there in a box containing 143 oranges? 165 oranges? 195 oranges?

17. Find the number of square inches in a vegetable bed 3 feet wide and 4 feet long.

18. The blackboard is 3 feet wide and 26 feet long. Find its surface in square feet.

19. A fruit dealer buys chestnuts at $3 a bushel, and sells them at $.10 a quart. Find his profit.

20. The schoolroom floor is 28 feet wide and 36 feet long. Find the number of square feet in the floor.

21. James lives 600 yards from the schoolhouse. How many feet does he walk in going to school in the morning and returning home in the afternoon?

This block or solid is 1 in. long, 1 in. wide, and 1 in. high.

It has six equal sides called **faces**, and each face contains **1 square inch**.

A block or solid with 6 **equal square faces** is called a **cube**.

A cube whose faces are each a square inch contains **1 cubic inch**, written 1 cu. in.

NOTE TO THE TEACHER. Secure 50 1-inch cubical blocks. Have pupils build solids, and count the number of cubic inches in each solid; the number of square inches on each face.
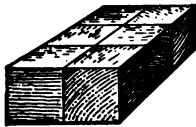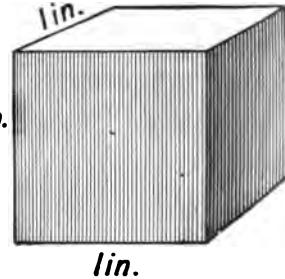
1. Build figure 1 with inch cubes. How many cubes does it take?

2. Build figure 2 with inch cubes. How many layers of blocks are there? How many blocks are there in each layer?
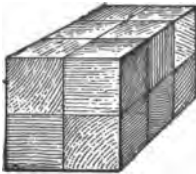
In 1 layer there are 6 cu. in.

In 2 layers there are 2×6 cu. in., or 12 cu. in.

The number of cubic inches or cubic feet in a solid is called the **volume** or **contents** of the solid.

FIG. 1.

FIG. 2.

3. Build 12 blocks into a solid that has 4 blocks in each layer. How many layers are there?

1. Build a figure 2 in. by 3 in. by 3 in. with inch cubes. How many does it take? How many layers? How many are there in each layer? 3×6 cu. in. $= 18$ cu. in. in the solid.
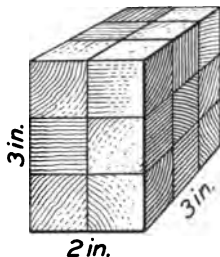
2. Build 10 other solids of different sizes with blocks, and ascertain the number of blocks in each.

3. The Christmas boxes sent to United States soldiers in France were 9 in. long, 4 in. wide, and 3 in. deep. How many cubic inches did they contain?

4. A brick is 8 in. long, 4 in. wide, and 2 in. thick. Find its volume in cubic inches.

5. A boy's book is 4 in. wide, 6 in. long, and 1 in. thick. Find the number of cubic inches in the book.

6. Mrs. Adams has a flower box that is 24 in. long, 8 in. wide, and 6 in. deep, inside measurement. How many cubic inches of soil will it take to fill it?

7. A square stick is 3 in. wide, 3 in. thick, and 12 in. long. How many cubic inches are there in the stick?

8. The inside of a box is 5 in. long, 4 in. wide, and 3 in. high. How many inch cubes can be built into it?

9. A schoolroom is 25 ft. wide, 30 ft. long, and 10 ft. high. How many pupils can be seated in this room, allowing 250 cu. ft. of air for each pupil?

Before you try to solve a problem, consider:

1. What facts are stated in the problem.

2. What kind of answer the question asks for.

3. By what steps the required answer can be found from the given facts.

1. How much is saved by buying 1 dozen jars of jelly for $ 3.00 instead of buying the jars separately at $ .26 apiece ?

$.26, price of one jar.
12, number of jars.
$3.12, cost of 12 jars.
3.00, lower cost.
$ .12, amount saved.

1. The facts stated are the price of a dozen jars and the price of a single jar.

2. The question is, "What is the difference in price by the two methods of purchase?"

3. First multiply $ .26 by 12; then subtract $ 3 from this product.

2. Jean has $ 5.75 worth of thrift stamps and Paul has $ 1.25 worth less. How much have both together ?

$5.75, amount Jean has.
1.25, amount less Paul has.
$4.50, amount Paul has.

$5.75, amount Jean has.
4.50, amount Paul has.
$10.25, amount both together have.

1. The facts stated are the amount Jean has and the amount *less* that Paul has.

2. The question is, "What is the amount both together have?"

3. First find Paul's amount by subtracting $ 1.25 from $ 5.75; then find the amount both have by adding Jean's and Paul's.

3. How much is saved on a dozen spools of thread by buying them at $ 1.31 a dozen instead of at $ .12 a spool?

4. A man sells a farm for $ 7625 and gains $ 1685. Find the cost of the farm.

5. At a sale sport shirts are reduced from $ 2.25 to $ .95. How much does a man save by buying 2 shirts at the sale?

1. George sold vegetables from his school garden in six days for the following sums: $1.75, $2.40, $3.50, $2.64, $2.52, $2.73. Find his average daily sales.

$1.75
2.40
3.50
2.64
2.52
2.73
6) $15.54, total for 6 days.
 $2.59, average each day.

1. The facts stated are the sales for each day.

2. The question is, "What is the daily average?"

3. First add all the sales; then divide by the number of days.

2. A creamery received milk for 6 days as follows: 7640 gallons, 8671 gallons, 9634 gallons, 8432 gallons, 8763 gallons, and 8604 gallons. What were the average daily receipts?

3. If Helen received 85 in arithmetic, 79 in grammar, 89 in history, 92 in geography, 86 in physiology, and 85 in writing, what was her average in these studies?

4. The attendance at a school was 604 on Monday, 607 on Tuesday, 598 on Wednesday, 603 on Thursday, 598 on Friday. What was the average daily attendance for the week?

5. The average temperature on Sunday was 74 degrees; on Monday, 87 degrees; on Tuesday, 80 degrees; on Wednesday, 85 degrees; on Thursday, 77 degrees; on Friday, 76 degrees; on Saturday, 74 degrees. Find the average daily temperature.

6. A laborer works 8 hours a day at $.50 an hour. How many days does it take him to earn $100?

1. A grocer opened an account and deposited in bank during the week the following sums : $495.65, $305.75, $693.29, $75.80, $243.89, and $375.77. He then had a balance to his credit of $1200.15. How much had he withdrawn ?

NOTE. First *estimate* the result mentally, as follows : $500 + $300 + $700 + $75 + $250 + $375 = $2200; $2200 − $1200 = $1000, approximate answer. Then find the exact result and compare the answers.

In examples 2 to 6, make a mental estimate and compare it with the exact result.

2. What is the value of 25 freight cars at $476 each ?

NOTE. As 25 is $\frac{1}{4}$ of 100, multiply 476 by 100 by adding two zeros, and divide the product by 4.

3. A man's salary was $950 a year. He paid $260 for board, $136 for clothing, and $115.75 for other expenses. How much had he left ?

4. A grocer sold 8 doz. lemons at 36¢ a dozen and $13\frac{1}{4}$ lb. butter at 48¢ a pound. How much did he receive ?

5. Anna bought for her mother :

8 lb. of coffee @ 28¢   24 oranges @ 5¢

$9\frac{1}{2}$ lb. of rice @ 8¢   8 cans of tomatoes @ 13¢

Find the amount of her purchases.

6. Find the cost of :

$27\frac{1}{2}$ lb. of fish @ 24¢   25 bottles of ammonia @ 8¢

$14\frac{3}{4}$ lb. of prunes @ 16¢   12 cans of peas @ 18¢

Saving Food and Fuel

1. How many pounds of meat are consumed in a day by 20,000,000 families who average $2\frac{1}{2}$ pounds a day?

2. If each of 20,000,000 families in the United States saves 1 ounce of meat daily, how many pounds will they all save in a day?

3. A saving of one slice of bread a day by every family will save 875,000 pounds of flour daily. How many pounds will be saved in a year of 365 days?

4. Three loaves of rye and cornmeal bread substituted each week for wheat bread by every family in the United States will save 33,000,000 pounds of wheat flour a week. How much does this amount to in 26 weeks?

5. The proper temperature of a room is 68°. If each of 20,000,000 families in the country saves a 5-pound shovelful of coal a day for 120 days, how many tons will be saved?

6. The more potatoes we eat, the less wheat we need. A potato weighing $1\frac{1}{4}$ ounces supplies as much starch as 1 slice of wheat bread. (*a*) How many ounces of potatoes should be substituted for a loaf of bread containing 20 slices? (*b*) How many pounds and ounces of potatoes?

(*a*) $20 \times 1\frac{1}{4}$ oz. = ? oz.

7. If each of 102,000,000 people saves 2 pounds of sugar a month, how many pounds will be saved in 3 months? how many tons?

Add and test each example in 1 minute:

	a	b	c
1.	$ 2785.00	$ 5870.00	$ 475.00
	597.55	29.60	6000.00
	3000.00	587.25	459.06
	987.46	45.03	250.00
	6750.00	6540.20	4278.64
	5340.02	8750.00	5782.98
	9876.54	2346.59	8796.32
	3201.89	4567.83	4123.56
2.	$ 6004.50	$ 6550.00	$ 2987.35
	887.95	278.93	500.83
	504.06	8.10	6789.05
	2874.59	200.02	200.06
	850.00	7007.05	678.46
	2250.05	520.84	4586.23
	275.83	4265.63	2080.95
	7817.89	6005.80	2345.10
3.	$ 475.00	$ 1286.40	$ 7665.00
	6000.20	587.52	2050.50
	579.80	3873.20	2002.02
	1000.50	78.00	879.30
	457.39	759.06	698.09
	100.10	9300.00	5000.10
	4555.05	759.84	898.45
	7016.89	5234.18	4987.56

Subtract and test five examples in 1 minute :

	a	b	c	d
	$970.75	$761.51	$834.78	$780.53
1.	387.68	137.49	209.99	489.95
2.	$781.32	$892.31	$721.20	$500.62
	467.64	704.92	430.07	189.84
3.	$883.11	$708.08	$812.21	$663.35
	579.64	597.79	721.26	487.95
4.	$776.43	$800.31	$721.05	$322.91
	81.79	98.89	89.64	285.89
5.	$700.02	$644.51	$900.42	$411.23
	127.76	394.82	289.65	309.88
6.	$900.76	$544.34	$645.25	$205.34
	398.97	497.69	528.46	108.38
7.	$652.17	$464.13	$541.26	$952.83
	489.79	389.84	409.68	503.24
8.	$725.74	$908.22	$851.02	$734.99
	637.75	127.75	389.92	456.82

Multiply and test each example in 1 minute:

1. 807×2045
2. 629×7708
3. 508×9430
4. 706×8075
5. 668×5638
6. 804×7652
7. 743×9536

8. 457×3087
9. 536×2946
10. 578×4352
11. 347×5238
12. 309×1378
13. 345×9203
14. 783×8736

15. 467×5934
16. 358×4572
17. 590×1742
18. 625×2834
19. 839×3456
20. 736×8754
21. 965×3420

22. 7892×435
23. 4569×301
24. 5238×763
25. 8741×650
26. 6329×485
27. 5736×984
28. 3492×807

29. 4759×803
30. 3642×745
31. 4758×546
32. 9026×493
33. 2984×367
34. 8534×703
35. 4736×750

36. 5678×908
37. 4329×754
38. 7534×842
39. 5692×734
40. 3587×605
41. 2479×573
42. 9357×486

43. $567 \times \$42.70$
44. $498 \times \$67.89$
45. $756 \times \$85.66$
46. $904 \times \$36.24$
47. $529 \times \$28.35$
48. $763 \times \$37.62$
49. $675 \times \$92.05$

50. $425 \times \$45.27$
51. $609 \times \$19.35$
52. $734 \times \$38.45$
53. $694 \times \$75.02$
54. $348 \times \$82.24$
55. $927 \times \$64.58$
56. $842 \times \$59.67$

57. $398 \times \$29.37$
58. $492 \times \$68.25$
59. $746 \times \$75.28$
60. $873 \times \$83.92$
61. $561 \times \$90.02$
62. $345 \times \$89.98$
63. $479 \times \$76.53$

Divide and test each example in 1 minute:

	a	b	c
1.	16,434 by 64	28,792 by 270	33,467 by 890
2.	34,643 by 28	75,639 by 770	77,304 by 860
3.	19,603 by 83	66,041 by 602	44,384 by 280
4.	94,432 by 62	77,006 by 784	35,690 by 761
5.	26,341 by 74	60,424 by 603	88,762 by 892
6.	36,236 by 37	90,328 by 735	56,044 by 883
7.	42,624 by 41	76,028 by 344	76,428 by 444
8.	76,342 by 36	84,605 by 766	23,688 by 985
9.	64,283 by 24	16,248 by 860	55,624 by 666
10.	55,022 by 82	74,637 by 450	34,632 by 555
11.	44,302 by 74	68,026 by 360	99,240 by 461
12.	16,792 by 81	84,132 by 770	36,002 by 880
13.	28,644 by 73	70,066 by 880	45,676 by 390
14.	74,305 by 37	50,468 by 480	76,324 by 302
15.	83,265 by 87	66,399 by 790	25,321 by 440
16.	78,325 by 75	24,166 by 670	65,436 by 784
17.	85,679 by 41	12,345 by 154	70,504 by 621
18.	39,410 by 52	67,890 by 221	62,131 by 905
19.	80,624 by 63	89,765 by 336	88,776 by 860
20.	73,102 by 74	43,210 by 742	54,340 by 408
21.	81,103 by 85	34,786 by 819	82,107 by 329
22.	77,777 by 96	57,602 by 745	62,434 by 752
23.	88,888 by 72	80,703 by 613	93,785 by 607

Find how long it takes you to get the *right answers* to each set of five examples.

I

1. How many inches are there in $6\frac{3}{4}$ ft.?
2. $2340 \times 475 = ?$
3. $48360 + 854 = ?$
4. $974.65 - $688.78 = ?$
5. $.83 + $6.92 + $349 = ?$

II

1. How many quarts are there in $4\frac{3}{4}$ bu.?
2. $65\frac{3}{8} + 37\frac{1}{8} = ?$
3. $10\frac{1}{2} + ? = 19\frac{1}{2}?$
4. $69\frac{3}{4} - 30\frac{1}{4} = ?$
5. $3\frac{1}{4} + 8\frac{3}{4} + 5 = ?$

III

1. $376 \times 500 = ?$
2. $4500 + 58 = ?$
3. $894.50 + 21 = ?$
4. $9\frac{1}{2}$ pk. = —— qt.
5. Find the cost of 3 gal. sirup at $35 \cancel{c}$ a quart.

IV

Find the cost of :
1. 6 tables @ $7.65.
2. $3\frac{1}{2}$ doz. buttons @ $40\cancel{c}$.
3. $3\frac{1}{4}$ lb. butter @ $56\cancel{c}$.
4. $4\frac{1}{8}$ yd. ribbon @ $16\cancel{c}$.
5. 3 pt. milk at $14\cancel{c}$ a quart.

V

1. $\frac{1}{2} + \frac{1}{4} = ?$
2. $\frac{1}{4} + \frac{1}{8} = ?$
3. $\frac{1}{2} + \frac{1}{8} = ?$
4. $\frac{1}{2} - \frac{1}{4} = ?$
5. If I cut $\frac{1}{8}$ yd. lace from 1 yd., how much remains?

VI

Find the cost of :
1. $2\frac{1}{8}$ doz. pens @ $24\cancel{c}$.
2. $3\frac{1}{2}$ qt. milk @ $16\cancel{c}$.
3. $5\frac{3}{4}$ lb. steak @ $44\cancel{c}$.
4. $6\frac{3}{4}$ pk. peaches @ $64\cancel{c}$.
5. $269.25 + 75 = ?$

CHAPTER VII
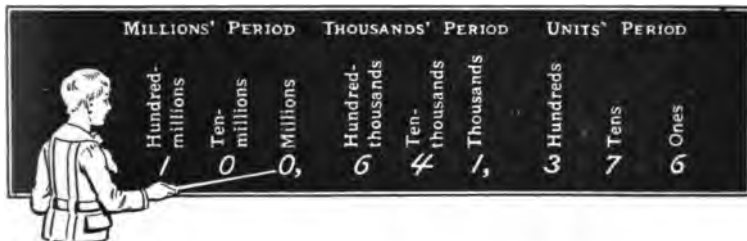
1. Read the number on the blackboard.

2. In 376, for what does the 6 stand? the 7? the 3?
376 = 3 hundreds, 7 tens, 6 ones.

3. Read 3498. For what does each figure stand?

Each figure has a value that depends on its **place** in the number. The first place beginning at the right of a number is called **ones'** place ; the second, **tens'** place ; the third, **hundreds'** place ; the fourth, **thousands'** place, etc.

4. Show that the left-hand 5 in the number 555 has a value, because of its place, that is 10 times the value of the middle 5, and 100 times the value of the right-hand 5.

A number containing more than four figures is often separated, for convenience in reading, into groups, or **periods,** of three figures each, beginning at the right. The name of the first period is **units** ; of the second period, **thousands** ; of the third period, **millions.**

The number on the blackboard above shows the arrangement of periods, and the three orders of figures in each.

Beginning at the right, mark off into periods, and read:

5. 2439   **8.** 758650   **11.** 405682   **14.** 1578563

6. 3750   **9.** 775570   **12.** 140560   **15.** 1556893

7. 4005   **10.** 205605   **13.** 685000   **16.** 1003704

Observe that *zeros* are enumerated but never read; that *and* is never read between integers; and that the *first period* is simply read but not named. Thus, 376 is read three hundred seventy-six.

Write :

17. 10 thousand 4 hundred 6.

18. 150 thousand 5 hundred 25.

19. 5 million 825 thousand 5 hundred 4.

20. 5 million 25 thousand 3.

21. 2 million 22 thousand 60.

22. 6 million 27 thousand 9.

23. 5 million 5 thousand 5.

24. 8 million 8 thousand 85.

25. Ten thousand one hundred ten.

26. Five million two hundred fifty.

27. Six million six thousand six.

28. Sixty million one hundred fifteen thousand five.

29. Forty million four.

30. Ninety-nine million six hundred thousand nine.

31. Eight million two hundred twenty-eight.

32. Ninety-eight million one hundred fifty-four.

33. Read ⸱ There were 1,500,000 women in the United States engaged in war industries.

34. Read : From 1907 to 1916 an average of 100,000,000 one-cent pieces was coined each year; in 1917, there were 213,500,000 one-cent pieces coined ; and in 1918, there were 445,228,201 pieces coined.

35. Read: Contracts were awarded in 1918 for 1,146,700 pairs of shoes for the army, costing $8,198,905.

| 10 cents = 1 dime |
| 10 dimes = 1 dollar |
| 100 cents = 1 dollar |

Since 10 dimes = 1 dollar, 1 dime = $\frac{1}{10}$ of a dollar, and since 100 cents = 1 dollar, 1 cent = $\frac{1}{100}$ of a dollar.

Tenths and *hundredths* of a dollar are sometimes called **decimal parts of a dollar.**

1. How many tenths of a dollar are 2 dimes ? 6 dimes ? 9 dimes ? 5 dimes? 7 dimes?

2. How many hundredths of a dollar are 2 cents? 5 cents? 10 cents? 25 cents? 75 cents?

Dollars and cents are written thus : $ 3.07, $ 3.25.

Cents are written thus: $.01, $.02, $.03, $.25, $.67.

NOTE. 1 cent may be written either $ 0.01 or $.01; 25 cents may be written either $ 0.25 or $.25, etc. The zero preceding the decimal point does not affect the result, and is sometimes written to show more prominently that cents and not dollars are represented. In columns, $ 3 is often written $ 3.00, $ 50 is written $ 50.00, etc.

The point separating the dollars and cents is called the **decimal point.**

Write in figures :

3. 5 dollars and 8 cents ; 107 dollars and 7 cents.

4. 9 dollars and 10 cents ; 250 dollars and 5 cents.

5. 107 dollars and 75 cents ; 300 dollars and 10 cents.

6. 525 dollars and 6 cents ; 78 dollars and 7 cents.

NOTE. Always read the word *and* between dollars and cents. Thus, read $ 6.09 " six dollars *and* nine cents."

Read; then write from dictation :

	a	b	c	d	e
	a	*b*	*c*	*d*	*e*
7.	\$5.09	\$5.05	\$3.00	\$4.00	\$ 12.09
8.	\$6.00	\$0.07	\$1.02	\$ .98	\$ 20.08
9.	\$8.47	\$9.99	\$1.00	\$1.65	\$254.45
10.	\$ .05	\$ .99	\$1.01	\$ .75	\$201.05
11.	\$7.09	\$ .37	\$1.74	\$ .81	\$150.50

REVIEW — ROMAN NUMBERS

1. Without looking at the clock face, write the Roman numbers showing the twelve hours.

On clock faces the Roman number IIII is used for 4; but in chapters in books, inscriptions on monuments, etc., 4 is usually written IV.
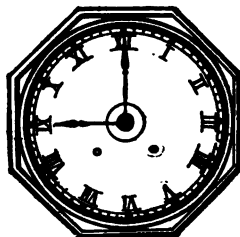
2. Memorize:

Letters	I	V	X	L	C	CC	CCC	CD	D	DC	M
Values	1	5	10	50	100	200	300	400	500	600	1000

I. When a letter is followed by the same letter or by one of less value, the values of the letters are to be added. Thus, XX = 20; CC = 200; XI = 11; XXX = 30; DC = 600; MD = 1500.

Write in Roman numbers:

3.	13	16	33	18	27	36	60
4.	31	32	17	26	28	55	51

II. When a letter is followed by another of greater value, the value of the smaller is to be subtracted from that of the greater. Thus, **IV** = 4; **IX** = 9; **XL** = 40; **XC** = 90; **CM** = 900.

Write in Roman numbers:

5.	4	45	43	47	91	93	96
6.	9	48	46	92	98	95	97
7.	904	940	990	909	945	998	1900

III. When a letter is placed between two letters of greater value, the value of the smaller is to be subtracted from the sum of the other two. Thus, **XIV** = 14; **XIX** = 19; **XXIX** = 29; **XLIX** = 49.

Write in Roman numbers:

8.	24	39	44	54	69	74	89
9.	29	34	49	59	64	79	84

10. A book has twenty chapters. Write them in order.

Read:

11.	XXI	LXV	XLIV	LXXX	LVI
12.	XXIV	LXXI	XCVII	M	LXI
13.	XXVIII	XLIII	LXII	MC	LXX
14.	XCIV	LXIV	MCIX	MDXX	MCMXX

Write in Roman numbers:

15.	66	33	100	400	700	1900
16.	88	49	200	500	800	1920

V. A bar placed over a number multiplies it by 1000. Thus, $\overline{V}$ = 5000; $\overline{IX}$ = 9000.

17. Write in Roman numbers: 4000   20,000   6000

18. Read: $\overline{VII}$ $\overline{IV}$ $\overline{III}$ $\overline{VIII}$ $\overline{IX}$ $\overline{X}$

The process of uniting two or more numbers to form one number is called **addition**.

The numbers to be added are called the **addends**.

The result of addition is called the **sum** or the **amount**.

Oral and Written Work

Answer rapidly :

1.	8	28	38	58	68
	9	9	9	9	9

8.	18	28	58	68	98
	7	7	7	7	7

2.	19	39	49	69	89
	6	6	6	6	6

9.	28	38	58	78	88
	6	6	6	6	6

3.	18	28	38	98	88
	8	8	8	8	8

10.	17	57	87	77	97
	9	9	9	9	9

4.	19	39	59	49	79
	5	5	5	5	5

11.	16	26	76	96	46
	7	7	7	7	7

5.	35	95	65	85	45
	6	6	6	6	6

12.	44	74	84	94	64
	9	9	9	9	9

6.	27	47	67	87	97
	8	8	8	8	8

13.	28	48	68	78	88
	5	5	5	5	5

7.	39	59	69	79	89
	8	8	8	8	8

14.	39	59	69	79	99
	7	7	7	7	7

To test addition, add in both directions.

Add, observing the groups that make 5, 10, 15, 20, etc. :

15.	16.	17.	18.	19.	20.	21.
4 } 10	7 }	8	7	8	3	2
6	8	3 }	4 }	9	9	6
7 } 10	4	7	6	3	8	4
3	7 }	6 }	5 }	5	2	8
5	8	4	7 }	4	7	4
9	1 }	2 }	2 }	6	8	6
8 } 10	0	1	6	7	5	5
2	9	7	5 }	9	4	7
5 }	3 }	5	4	8	2	8
7 } 20	8 }	6 }	5 }	9	1	1
8	9	4	6	6	3	9

Write from dictation; then add and test, observing groups :

22.	23.	24.	25.	26.
541	862	720	839	564
462 } 8	321	287 } 10	463	268
376	456 } 15	823	726 } 15	374
814 } 10	289	541 } 10	339	827 } 10
296	315	569	187	623

27.	28.	29.	30.	31.
325	4250	20,150	3984	52,306
237	629	107	4	20,006
63	47	360	296	30,750
104	2307	26,347	307	5,600
9	234	6,066	6875	170
937	276	205	4397	52,879
428	999	304	6123	30,562
632	708	591	4187	41,028

Add :

32.	33.	34.	35.	36.
35,701	575	5609	9401	8026
6,531	1039	41	672	643
820	9901	60	56	29
43	601	853	803	660
7,501	8010	731	10	9032
4,507	301	550	9083	8009

37.	38.	39.	40.
$ 80.00	$ 329.60	$ 200.65	$ 3245.07
1.05	300.06	30.00	4706.50
6.09	6.09	976.38	5079.06
87.63	709.36	40.79	5904.00

Numbers applied to the same kind of unit are called **like numbers** ; as, 3 ft. and 5 ft., or 3 and 5 ; but not 3 ft. and 5 ¢. **Only like numbers can be added or subtracted.**

Time yourself in adding these examples. Then try again and see whether you can beat your first record.

41.	42.	43.	44.
$ 25.36	$ 163.75	$ 243.15	$ 121.48
43.72	275.84	65.74	83.62
96.81	486.39	182.33	275.14
39.47	928.75	34.62	8.73
62.58	265.73	215.73	16.28

45.	46.	47.	48.
$ 3795.90	$ 4678.65	$ 9450.00	$ 6354.00
4784.00	875.60	845.76	280.01
5450.25	3490.00	46.01	4045.06
6350.00	348.45	749.98	98.00
7450.05	2246.79	3.87	.98
5365.00	1400.00	4021.23	12.12

The process of finding the difference between two numbers, or of taking one number from another, is called **subtraction**.

Subtraction may also be defined as the process of finding what number must be added to a number to make a given number.

The number from which we subtract is called the **minuend**; the number subtracted is called the **subtrahend**; and the answer is called the **difference**, or the **remainder**.

Oral Work

Drill thoroughly on these combinations in subtraction:

	a	b	c	d	e	f	g	h	i	j	k
1.	13	15	12	16	17	13	12	14	17	15	11
	8	7	6	7	9	9	3	9	8	9	3

2. Subtract each of the numbers from 1 to 9 from 69; from 94; from 85; from 76; from 53; from 62; from 41; from 30; from 28; from 77.

Subtract rapidly:

	a	b	c	d	e	f	g	h	i	j
3.	14	16	15	12	16	15	13	10	11	14
	6	8	8	5	9	6	6	4	6	7
4.	15	13	11	10	15	14	18	13	17	13
	11	4	8	9	5	8	16	11	13	12

In 5 a, 64 − 30 = 34; 34 − 6 = 28. Think, 34, 28.

	a	b	c	d	e	f	g
5.	64	53	72	54	71	57	61
	36	16	53	36	39	38	47
6.	53 ¢	$56	91 ¢	84 ¢	$83	74 ¢	$76
	27 ¢	$37	57 ¢	55 ¢	$54	37 ¢	$49

To test subtraction, add the remainder to the subtrahend.

Written Work

Subtract each number below from 1000, allowing 1 minute for each column :

1.	225	**5.**	216	**9.**	725	**13.**	715	**17.**	375
2.	314	**6.**	500	**10.**	946	**14.**	800	**18.**	814
3.	625	**7.**	499	**11.**	328	**15.**	125	**19.**	731
4.	374	**8.**	795	**12.**	613	**16.**	629	**20.**	656

21–40. Subtract each of the numbers in examples 1–20 from 10,000.

Subtract, timing your work. Then try again and see whether you can beat your record. Check results by adding.

41.	607,008 448,789	**44.**	180,260 98,775	**47.**	800,647 98,749
42.	756,008 398,497	**45.**	100,907 49,899	**48.**	870,009 698,058
43.	640,006 290,809	**46.**	230,900 97,897	**49.**	906,700 798,897

50. 36,005 — 19,096   **60.** 630,209 — 189,768

51. 90,000 — 27,938   **61.** 620,005 — 246,937

52. 23,000 — 17,500   **62.** 610,034 — 263,805

53. $4629.70 — $3675.84   **63.** $2473.87 — $629.75

54. $1475.55 — $539.47   **64.** $9000.45 — $4167.23

55. $3000.73 — $2036.75   **65.** $6343.75 — $900.84

56. $9143.65 — $6183.69   **66.** $9143.92 — $6287.75

57. $24,000.47 — $6937.64   **67.** $4816.75 — $2407.84

58. $2039.05 — $1729.89   **68.** $94,367.48 — $21,697.83

59. $9400.37 — $2869.94   **69.** $21,485.86 — $11,475.97

Keeping a Cash Account

Every pupil should form the habit of
keeping an account in a small blank
book.

1919		RECEIPTS					PAYMENTS		
Aug.	5	Cash on hand	3	50	Aug.	6	2 Thrift stamps		50
	6	Errand		25		7	Car fare		10
	7	Gift	10	00		8	Red Cross	1	00
	9	Sold beets		25		9	Collar		30
						11	*Balance*	12	10
			14	00				14	00
Aug.	11	Balance	12	10					

The sum of the cash on hand and the receipts (left-hand side) is $14.
The sum of the payments (right-hand side) is $1.90. The difference,
$12.10, is written as *Balance* in the right-hand column below the last
payment; and the column is then added, showing $14. As this amount
is the same as the total of the receipts column, the account is correct.
"Balance $12.10" is also written in the receipts column below the sum.

Make out and balance the following cash accounts:

1. Receipts: Feb. 4, cash on hand, $5.15; Feb. 5, shovel-
ing snow, $.50; Feb. 6, tending furnace, $.25; Feb. 7,
carrying bag, $.10; Feb. 8, chopping wood, $.15.

Payments: Feb. 5, repairing skates, $.50; Feb. 6, fountain
pen, $2; Feb. 7, skating cap, $1.50; Feb. 8, muffler, $.75.

2. Receipts: July 1, cash on hand, $7.75; July 2, run-
ning errands, $.15; July 3, weeding garden, $.50.

Payments; July 1, fish line, $.50; July 3, bathing tights,
$.55; July 5, ball, $.50; tennis racket, $5.

3. Receipts: Oct. 7, cash on hand, $4.25; Oct. 8, securing
magazine subscriptions, $1; Oct. 9, making dresses for
Helen's doll, $1.50; Oct. 11, weekly allowance, $.50.

Payments: Oct. 8, stationery, $.65; Oct. 9, car fare, $.10;
Oct. 10, club dues, $1.

The process of taking one number as many times as there are units in another is called **multiplication.**

The number to be multiplied is called the **multiplicand;** the number showing how many times the multiplicand is to be taken is called the **multiplier;** and the result of multiplication is called the **product.** The multiplicand and the multiplier are called **factors** of the product.

When the multiplier is written *before* the sign ×, as in 4 × 8 ft., the sign is read "*times.*" Thus, 4 × 8 ft. is read 4 *times* 8 feet. When it is written *after* the sign, the sign is read "*multiplied by.*" Thus, 4 ft. × 8 is read 4 ft. *multiplied by* 8.

1. Does the expression " 6 apples times 4 " make sense ? The multiplier cannot name things, as, feet, hours, etc., since it indicates the number of times the multiplicand is to be taken.

A number used without reference to a particular thing is called an **abstract number;** as, 5, 6, 50.

A number used with reference to a particular thing is called a **concrete number;** as, 5 trees, 6 dollars, 50 inches.

The multiplier is always regarded as an *abstract number.* The product is always like the multiplicand.

2. Compare the product of 8 × 6 with the product of 6 × 8; the product of 2 × 14 with the product of 14 × 2. *Either factor may be regarded as the multiplier.*

NOTE. The multiplicand may be either concrete or abstract. When it is concrete, the product has the same name as the multiplicand.

How to multiply and divide by 10, 20, 100, etc.

1. Multiply 42 by 10. Annex a zero to the right of 42. Is there any difference in the products ? Which of these two methods of multiplying is the *shorter?* Multiply 42 by 100. Annex two zeros to the right of 42.

2. Multiply each of the following numbers by 10; by 100:

    43   26   75   96   288   694   786   813   465   710   634

Written Work

1. Multiply 323 by 325.

Multiplicand,	**323**		**323**
Multiplier,	**325**		**325**
1st partial product,	**1615** =	5 × 323	**1615**
2d partial product,	**6460** =	20 × 323	**646**
3d partial product,	**96900** =	300 × 323	**969**
Entire product,	**104975** =	325 × 323	**104975**

To test multiplication, use the multiplicand for a multiplier and perform the multiplication again; or, divide the product by the multiplier.

2. How much will 48 chairs cost at $1.25 each?

$ 1.25
   48
----
10 00   Multiply as before, and mark off from the right, in the
50 0   product, two places for cents.

$ 60.00

3. 45 × 63 bu. = ?   **14.** 42 × 89 = ?   **25.** 47 × $ 5.67 = ?

4. 29 × 87 ft. = ?   **15.** 50 × 78 = ?   **26.** 78 × $ 3.50 = ?

5. 46 × 215 doz.= ?   **16.** 45 × 38 = ?   **27.** 43 × $ 5.69 = ?

6. 78 × $ 326 = ?   **17.** 45 × 67 = ?   **28.** 75 × $ 8.97 = ?

7. 86 × $ 293 = ?   **18.** 48 × 67 = ?   **29.** 82 × $ 49.85 = ?

8. 91 × $ 145 = ?   **19.** 67 × 34 = ?   **30.** 98 × $ 67.80 = ?

9. 97 × 609 = ?   **20.** 47 × 200 = ?   **31.** 65 × $ 99.94 = ?

10. 85 × 987 = ?   **21.** 67 × 450 = ?   **32.** 76 × $ 87.87 = ?

11. 68 × 694 = ?   **22.** 54 × 709 = ?   **33.** 78 × $ 66.05 = ?

12. 65 × 45 = ?   **23.** 75 × 908 = ?   **34.** 46 × $ 68.07 = ?

13. 78 × 56 = ?   **24.** 56 × 109 = ?   **35.** 25 × $ 60.80 = ?

36.	850	37.	6754	38.	$ 60.70
	67		608		80 06
	5950		54032		364 20
	5100		40524		48560
	56950		4106432		$ 485964.20

Find products and test:

39.	809 × 3750	**49.**	678 × 8190	**59.**	500 × 6780
40.	370 × 2009	**50.**	547 × 7800	**60.**	450 × 6001
41.	400 × 3098	**51.**	101 × 8901	**61.**	780 × 6791
42.	209 × 6708	**52.**	560 × 9000	**62.**	560 × 6401
43.	609 × 8078	**53.**	798 × 9008	**63.**	101 × 1000
44.	458 × 6009	**54.**	567 × 7980	**64.**	109 × 2300
45.	650 × 8079	**55.**	440 × 7860	**65.**	708 × 8001
46.	407 × 7900	**56.**	450 × 7009	**66.**	650 × 5160
47.	608 × 8004	**57.**	579 × 6009	**67.**	765 × 7180
48.	440 × 7980	**58.**	478 × 4890	**68.**	832 × 9001

Multiply and test :

69. 6425		*a.* 247	Form 10 groups of 10 examples
70. 1024		*b.* 344	each by multiplying each multipli-
71. 8720		*c.* 564	cand by each of the multipliers,
72. 9652		*d.* 746	thus :
73. 8665	by	*e.* 804	69 *a.* 247 × 6425 = ?
74. 7894		*f.* 961	69 *b.* 344 × 6425 = ?
75. 8465		*g.* 869	76 *i.* 968 × 7695 = ?
76. 7695		*h.* 796	NOTE. The teacher may assign a
77. 8425		*i.* 968	different group to each of 10 class
78. 9476		*j.* 898	teams and notice which team makes

the best record for speed and accuracy.

The process of finding how many times one number contains another, or of separating a number into equal parts, is called **division.**

Division may be defined also as the process of finding one of two factors when their product and the other factor are given.

The number to be divided is called the **dividend;** the number by which we divide is called the **divisor;** and the result of division is called the **quotient.**

The part of the dividend remaining when the division is not exact is called the **remainder.**

Oral Work

1. Division is indicated in three ways : $15 \div 3$, $\frac{15}{3}$, $3)15$.

2. In $15 \div 3$, which number is the dividend ? Which is the divisor ?

If the dividend and the divisor are concrete, they must have the same name. The quotient is then abstract. Thus, $7 (divisor) is contained in $21 (dividend) 3 times (quotient).

When the divisor is abstract and the dividend concrete, the quotient has the same name as the dividend. Thus, $21 $\div$ 7 = $3, or $\frac{1}{7}$ of $21 = $3.

When we consider that $7 is contained 3 times in $21, the problem differs from the separation of $21 into 7 equal *parts.* The latter kind of division is called **partition.**

3. Find $\frac{1}{8}$ of 120; 160; 200; 400; 480; 960.

Give the quotients :

4. $160 \div 4$	**9.** $720 \div 24$	**14.** $750 \div 15$	**19.** $880 \div 4$
5. $280 \div 7$	**10.** $900 \div 15$	**15.** $400 \div 4$	**20.** $1200 \div 20$
6. $960 \div 8$	**11.** $500 \div 2$	**16.** $360 \div 6$	**21.** $7200 \div 60$
7. $1080 \div 12$	**12.** $900 \div 45$	**17.** $360 \div 5$	**22.** $9000 \div 60$
8. $900 \div 5$	**13.** $100 \div 25$	**18.** $900 \div 3$	**23.** $3600 \div 30$

How to divide by 10, 100, 1000, etc.

Oral Work

1. Divide 40 by 10. Cut off a zero from the right of
40.   Is there any difference in the quotients? Which of
these two methods of dividing is the *shorter?*

2. Divide 2436 by 100.   1|00)**24**|**36**
                                                       24; r. 36

3. Divide each of the following numbers by 10; by 100;
by 1000: 3000; 46,000; 273,000; 619,000; 81,400; 2000;
8626; 46,153; 814,256.

Written, Work

1. Divide 81,906 by 34.   Notice in the third division that
30 is smaller than the divisor.   Place zero in the quotient,
write 6 to the right of 30, and divide 306 by 34.

2409, Quotient
34)**81906**, Dividend
  68
  139
  136
   306
   306

To test division, multiply the quo-
tient by the divisor. If there is a
remainder, add it to the product.

Divide and test:

2. 22,044 ÷ 44	**9.** 432,107 ÷ 31	**16.** 295,625 by 43
3. 19,095 ÷ 95	**10.** 654,321 ÷ 52	**17.** 362,181 by 63
4. 36,223 ÷ 23	**11.** 978,001 ÷ 73	**18.** 463,595 by 79
5. 46,935 ÷ 63	**12.** 803,402 ÷ 84	**19.** 736,840 by 65
6. 37,185 ÷ 88	**13.** 549,802 ÷ 95	**20.** 406,090 by 65
7. 46,221 ÷ 21	**14.** 400,001 ÷ 89	**21.** 213,965 by 133
8. 28,497 ÷ 21	**15.** 309,008 ÷ 97	**22.** 816,023 by 147

23. $70,004 by 172   **28.** 678,001 by 105   **33.** 765,432 by 509
24. $74,029 by 181   **29.** 700,000 by 220   **34.** 678,900 by 678
25. $26,686 by 378   **30.** 850,020 by 307   **35.** 394,201 by 727
26. $41,324 by 492   **31.** 449,091 by 145   **36.** 400,009 by 836
27. $87,912 by 578   **32.** 330,789 by 232   **37.** 801,020 by 905

Divide and test:

38. 6,464,341 ⎫   ⎧ *a.* 268
39. 7,846,760 ⎪   ⎪ *b.* 354
40. 5,864,548 ⎪   ⎪ *c.* 676
41. 8,645,341 ⎬ by   ⎨ *d.* 758
42. 9,624,872 ⎪   ⎪ *e.* 865
43. 7,784,100 ⎪   ⎪ *f.* 984
44. 6,810,404 ⎪   ⎪ *g.* 789
45. 7,904,025 ⎭   ⎩ *h.* 897

Form 8 groups of 8 examples each by dividing each dividend by each divisor, thus:

38 *a.* 6,464,341 ÷ 268 = ?
43 *c.* 7,784,100 ÷ 676 = ?

NOTE. The teacher may assign a different group to each of 8 class teams and notice which team makes the best record for accuracy and speed.

Written Work

How to divide dollars and cents.

1. If 25 bu. oats cost $20.00, find the cost per bushel.

$.80, cost of 1 bu.
25)$20.00
     20 0
     ―――
        0

2. At $.18 a box, how many boxes of berries can be bought for $1.80 ?

10, number of boxes
$.18)$1.80
       1 8
       ――
          0

Find the cost of 1 if:

3. 12 yd. cloth cost $13.44
4. 16 books cost $13.60
5. 15 yd. ribbon cost $1.35
6. 1 doz. plates cost $16.80

Find the number if:

7. Pads at $.08 cost $3.20
8. Caps at $.72 cost $10.80
9. Plates at $.18 cost $8.10
10. Collars at $.25 cost $3.25

School Savings Banks

```
┌─────────────────────────┐
│  ┌───────────────────┐  │
│  │ "A PENNY SAVED    │  │
│  │ IS A PENNY GAINED"│  │
│  └───────────────────┘  │
│                         │
│  SCHOOL SAVINGS BANK    │
│          OF             │
│                         │
│    Franklin School      │
│     Lima, Ohio          │
│   IN ACCOUNT WITH       │
│                         │
│     Anna Blake          │
│     Cora Field          │
│              TEACHER    │
└─────────────────────────┘
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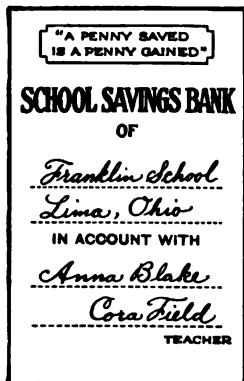
NOTE. The smallest amount received in school savings banks varies from 1¢ to 5¢. The money should be **earned** by the labor of the pupil or **saved** by self-denial. Every school savings bank has connections with some State savings bank where each pupil's deposits are sent when they reach $1 or $5, according to the rules of the bank. The pupil then receives a regular bank book.

1. Anna Blake deposited to her school savings bank account the money she earned by making 8 jars of jelly from windfall apples and selling them at 25¢ a jar. The jars cost 5¢ apiece and she used for each jar of jelly ¼ lb. of sugar at 10¢ a pound. How much profit did she deposit?

2. One Monday 24· pupils deposited 5¢ each, 35 pupils 10¢ each, and 19 pupils 15¢ each. On the same day 4 pupils withdrew 5¢ each and 5 withdrew 15¢ each. What was the difference between the deposits and the withdrawals?

SCHOOL SAVINGS BANKS DIVISION	NO. OF DEPOSITORS	AMOUNT DEPOSITED	AMOUNT WITHDRAWN
North Atlantic Division	112,443	$2,831,196.63	$1,815,350.02
North Central Division	80,551	1,003,479.46	565,165.66
South Atlantic Division	1,748	43,951.71	39,961.80
South Central Division	1,533	6,044.50	3.00
Western Division	20,531	368,395.85	248,270.85

3. Find the total amount deposited; the amount withdrawn.

4. How much more was deposited by the North Atlantic Division than by the South Atlantic Division?

5. Find to cents the average amount deposited by each depositor; the average amount withdrawn.

The whole numbers which are multiplied together to make a product are called the **factors** of the product. Thus, in $2 \times 3 = 6$, 2 and 3 are the factors of 6.

Oral Work

1. Name two factors that produce 8, 10, 12, 14, 16, 18, 20.

2. The product of two factors is 24, and one of the factors is 3. What is the other factor?

	Factor	Product	Other Factor		Factor	Product	Other Factor
3.	2	20	?	**9.**	10	40	?
4.	5	50	?	**10.**	15	30	?
5.	8	24	?	**11.**	12	60	?
6.	9	27	?	**12.**	11	77	?
7.	7	35	?	**13.**	13	52	?
8.	4	28	?	**14.**	17	68	?

A whole number is called an **integer** or an **integral number.**

When we say that 8 is a multiple of both 2 and 4, we mean that both 2 and 4 are exactly contained in 8 an *integral number* of times. 20 is a multiple of both 4 and 5, because both 4 and 5 are exactly contained in 20.

A number that contains two or more numbers an integral number of times is called a **multiple** of those numbers.

15. Find the factors of 18, as, 9×2, or 6×3. Since 18 exactly contains 9 and 2 or 6 and 3, it is a multiple of 9 and 2 and of 6 and 3.

The number 24 is a multiple of what two numbers? the number 36? 48? 16? 12?

The **dividend** in division is always the product of two factors, — the divisor and the quotient. Thus, in $48 \div 6 = 8$, 48 is the product of the factors 6 and 8.

Find the unknown terms:

	DIVISOR	DIVIDEND	QUOTIENT		DIVISOR	DIVIDEND	QUOTIENT
16.	12	144	?	**26.**	84	7	?
17.	10	100	?	**27.**	?	135	45
18.	12	600	?	**28.**	?	125	5
19.	12	180	?	**29.**	?	60	12
20.	?	288	12	**30.**	?	81	9
21.	?	144	12	**31.**	?	150	2
22.	?	450	15	**32.**	20	?	24
23.	?	500	10	**33.**	36	?	20
24.	10	?	18	**34.**	48	?	40
25.	20	?	40	**35.**	50	?	72

Written Work

	DIVISOR	DIVIDEND	QUOTIENT		DIVISOR	DIVIDEND	QUOTIENT
1.	25	650	?	**11.**	35	2205	?
2.	23	736	?	**12.**	?	2548	52
3.	51	918	?	**13.**	49	2793	?
4.	?	544	32	**14.**	36	?	46
5.	?	812	28	**15.**	?	2263	73
6.	24	672	?	**16.**	64	2816	?
7.	33	?	29	**17.**	37	?	39
8.	39	?	18	**18.**	?	1775	25
9.	16	?	38	**19.**	48	?	52
10.	27	?	34	**20.**	49	3136	?

Halves, Fourths, and Eighths

Oral Work

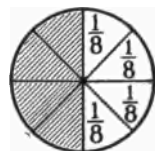1 unit $= \frac{2}{2}$.   1 unit $= \frac{4}{4}$.   1 unit $= \frac{8}{8}$.
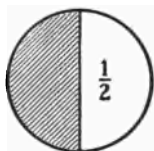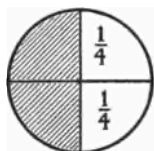
$\frac{1}{2}$ $=$ $\frac{2}{4}$ $=$ $\frac{4}{8}$

1. What is $\frac{1}{2}$ of 8 ? $\frac{1}{2}$ of 16 ? $\frac{1}{2}$ of 24 ?

2. What is $\frac{1}{4}$ of 8 ? $\frac{1}{4}$ of 16 ? $\frac{1}{4}$ of 24 ? $\frac{3}{4}$ of 24 ?

3. What is $\frac{1}{8}$ of 8 ? $\frac{1}{8}$ of 16 ? $\frac{1}{8}$ of 24 ? $\frac{3}{8}$ of 24 ?

4. The first circle is divided into how many equal parts ? What is each part called ?

5. The second circle is divided into how many equal parts ? What is each part called ?

6. The third circle is divided into how many equal parts? What is each part called ?

7. $\frac{1}{2}$ of the first circle $= \frac{?}{4}$ of the second circle. $\frac{1}{2}$ of the first circle $= \frac{?}{8}$ of the third circle.

8. How many halves of a circle are there in a whole circle? how many fourths of a circle ? how many eighths of a circle ?

9. Change $\frac{1}{2}$ to fourths ; thus, $\frac{1}{2} = \frac{2}{4}$.

10. Change $\frac{2}{2}$ to fourths.

11. Change $\frac{1}{2}$ to eighths ; $\frac{3}{4}$ to eighths.

12. How many units are there in $\frac{2}{2}$? $\frac{4}{4}$? $\frac{8}{8}$?

13. $\frac{1}{2}$ of the first circle $+\frac{1}{2}$ of the first circle $=$ how many times the first circle ?　Then $\frac{1}{2}+\frac{1}{2}=$ how many?

14. $\frac{1}{4}$ of the second circle $+\frac{1}{4}$ of the second circle $=$ what part of the second circle ?　Then $\frac{1}{4}+\frac{1}{4}=$ how many ?

15. $\frac{2}{4}$ of the second circle $+\frac{2}{4}$ of the second circle $=$ how many times the second circle ?　Then $\frac{2}{4}+\frac{2}{4}=$ how many ?

16. $\frac{2}{8}$ of the third circle $=\frac{?}{4}$ of the third circle.

17. $\frac{4}{8}$ of the third circle $=\frac{?}{2}$ of the same circle.

18. $\frac{1}{4}=\frac{?}{8}$; $\frac{1}{2}=\frac{?}{8}=\frac{?}{4}$; $\frac{4}{8}=\frac{?}{2}=\frac{?}{4}$.

19. $\frac{1}{2}$ of an orange $=\frac{?}{4}=\frac{?}{8}$ of the same orange.

20. $\$\frac{1}{4}+\$\frac{1}{4}=\$\frac{?}{4}$; $\$\frac{1}{2}+\$\frac{1}{4}=\$\frac{?}{4}$.

21. $\frac{1}{8}$ day $+\frac{1}{2}$ day $=\frac{?}{8}$ day.

22. $\$\frac{4}{4}+\$\frac{4}{4}=\$\frac{?}{4}$; $\$\frac{8}{4}=$ how many dollars ?

23. $\frac{8}{4}$ days $=-$ days ; $\frac{6}{4}$ days $=1$ day and $\frac{?}{4}$ days.

24. Draw, in order of their size, $\frac{1}{2}$ of the first circle, $\frac{3}{4}$ of the second circle, and $\frac{3}{8}$ of the third circle.

One thing of any kind is called a **unit**; as, 1, 1 ¢, 1 boy.

One or more of the equal parts of a unit is called a **fraction**.

The number written below the line, which shows into how many equal parts the unit is divided, is called the **denominator** of a fraction.

The number written above the line, which shows how many equal parts of the fraction are taken, is called the **numerator** of the fraction.

The numerator and the denominator are called the **terms** of a fraction.

A fraction may also be regarded as an **indicated division**. Thus, $\frac{9}{3}=9 \div 3$; $\frac{3}{4}=3 \div 4$.

When 15 is divided by 4 the remainder, 3, may be expressed as the fraction, $\frac{3}{4}$.

Express the remainders as fractions : $17 \div 4$; $18 \div 5$; $18 \div 8$; $24 \div 5$; $23 \div 6$; $71 \div 8$; $89 \div 9$; $55 \div 7$.

25. Write in figures one third; one fourth; five eighths. In the fraction $\frac{3}{4}$, what does the 4 show? the 3?

26. Read $\frac{1}{2}$; $\frac{1}{3}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{3}{8}$; $\frac{5}{8}$; $\frac{7}{8}$.

Fractions are said to be **equivalent** when they have the same value. Thus, $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{4}{8}$ are equivalent fractions.

A number made up of a whole number and a fraction is a **mixed number**; as, $4\frac{1}{2}$, $3\frac{7}{8}$, $5\frac{3}{4}$.

Written Work

1. Add $\frac{1}{2}$ and $\frac{3}{8}$.

$$\frac{1}{2} = \frac{4}{8}$$
$$\frac{3}{8} = \frac{3}{8}$$
$$\frac{7}{8}, \text{ Sum.}$$

Change $\frac{1}{2}$ to eighths.
The sum of $\frac{4}{8}$ and $\frac{3}{8}$ is $\frac{7}{8}$.

2. Add $2\frac{1}{2}$ and $1\frac{3}{8}$.

$$2\frac{1}{2}$$
$$1\frac{3}{8}$$
$$3\frac{7}{8}, \text{ Sum.}$$

First add the fractions as above.
Then add the whole numbers.
The sum is $3\frac{7}{8}$.

3. From $\frac{1}{2}$ subtract $\frac{3}{8}$.

$$\frac{1}{2} = \frac{4}{8}$$
$$\frac{3}{8} = \frac{3}{8}$$
$$\frac{1}{8}, \text{ Difference.}$$

Change $\frac{1}{2}$ to eighths.
The difference between $\frac{4}{8}$ and $\frac{3}{8}$ is $\frac{1}{8}$.

4. From $12\frac{1}{2}$ subtract $2\frac{3}{8}$.

$$12\frac{1}{2} = 12\frac{4}{8}$$
$$2\frac{3}{8} = 2\frac{3}{8}$$
$$10\frac{1}{8}, \text{ Difference.}$$

The difference between the fractions is $\frac{1}{8}$.
The difference between the whole numbers is 10.
The difference is therefore $10\frac{1}{8}$.

5. $\frac{1}{2}+\frac{1}{4}=$? $\frac{1}{2}+\frac{1}{8}=$? $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}=$?

6. $\frac{1}{2}+\frac{1}{2}=\frac{2}{2}=$? $\frac{1}{2}+\frac{5}{8}=\frac{9}{8}=$?

7. $\frac{1}{2}+\frac{3}{4}=$? $\frac{3}{4}+\frac{5}{4}=$? $\frac{1}{4}+\frac{3}{4}+\frac{5}{4}=$?

8. $\frac{1}{2}-\frac{1}{8}=$? $\frac{1}{2}-\frac{1}{4}=$? $\frac{3}{4}-\frac{1}{8}=$? $\frac{3}{4}-\frac{3}{8}=$?

Add:

9. $3\frac{1}{2}$	**10.** $7\frac{1}{4}$	**11.** $7\frac{1}{4}$	**12.** $9\frac{1}{8}$	**13.** $5\frac{1}{8}$
$3\frac{1}{8}$	$8\frac{1}{2}$	$9\frac{3}{8}$	$6\frac{1}{2}$	$12\frac{1}{4}$

Subtract; then add:

14. $10\frac{3}{8}$	**17.** $12\frac{1}{2}$	**20.** $27\frac{3}{4}$	**23.** $19\frac{1}{4}$	**26.** $36\frac{1}{2}$
$5\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{3}{8}$	$6\frac{1}{8}$	$16\frac{3}{8}$

15. $62\frac{5}{8}$	**18.** $63\frac{3}{4}$	**21.** $26\frac{3}{4}$	**24.** $18\frac{3}{4}$	**27.** $40\frac{3}{4}$
$31\frac{3}{8}$	$39\frac{1}{2}$	$24\frac{3}{8}$	$9\frac{3}{8}$	$20\frac{1}{8}$

16. $5\frac{1}{2}$	**19.** $9\frac{3}{4}$	**22** $9\frac{1}{2}$	**25.** $5\frac{1}{4}$	**28.** $8\frac{3}{4}$
$3\frac{1}{4}$	$8\frac{1}{2}$	$3\frac{1}{2}$	4	$2\frac{1}{2}$

Add:

29. $3\frac{1}{2}$	**30.** $67\frac{1}{4}$	**31.** $65\frac{1}{2}$	**32.** $25\frac{3}{4}$	**33.** $56\frac{1}{4}$
$4\frac{1}{4}$	$6\frac{1}{2}$	$7\frac{3}{8}$	$8\frac{1}{4}$	$6\frac{1}{8}$

34. Ruth bought $\frac{1}{2}$ yd. of red ribbon and $\frac{1}{4}$ yd. of blue ribbon.   How much did she buy in all?
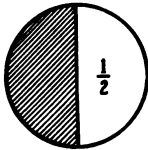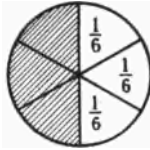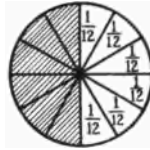
35. Marian had $1\frac{5}{8}$ yd. of linen and used $\frac{1}{2}$ yd.   How much had she left?

36. John had a string $\frac{3}{4}$ yd. long from which he cut $\frac{5}{8}$ yd. ᵀow long was the part remaining?

37. Mary had $2\frac{3}{8}$ lb. of pepper, and used $\frac{1}{4}$ lb.   How much d she left?

Halves, Sixths, and Twelfths

Oral Work

1 unit = $\frac{2}{2}$.   1 unit = $\frac{6}{6}$.   1 unit = $\frac{12}{12}$.

$\frac{1}{2}$

$\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$

$\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$

$\frac{1}{2}$ = $\frac{3}{6}$ = $\frac{6}{12}$

1. What is $\frac{1}{2}$ of 12? $\frac{1}{2}$ of 24? $\frac{1}{2}$ of 36?

2. What is $\frac{1}{6}$ of 12? $\frac{1}{6}$ of 24? $\frac{1}{6}$ of 36? $\frac{5}{6}$ of 36?

3. What is $\frac{1}{12}$ of 12? $\frac{1}{12}$ of 24? $\frac{1}{12}$ of 36? $\frac{5}{12}$ of 36?

4. $\frac{1}{2} = \frac{7}{12}$; $\frac{6}{12} = \frac{7}{2}$; $\frac{3}{6} = \frac{1}{2}$; $\frac{1}{2} = \frac{7}{6}$; $\frac{6}{12} = \frac{7}{6}$; $\frac{1}{6} + \frac{5}{6} + \frac{3}{6} = —.

5. $\frac{2}{6}$ of a circle equals $\frac{7}{12}$ of the same circle. Draw on paper and cut out circles or oblongs to show these relations.

6. Which is larger, $\frac{1}{2}$ of an apple or $\frac{5}{6}$ of the same apple? how much larger?

7. $\frac{1}{2} = \frac{7}{12}$; $\frac{1}{6} = \frac{7}{12}$; $\frac{5}{6} = \frac{7}{12}$; $\frac{24}{12} = —ones.

8. Show by comparing the circles above that $\frac{1}{6}$ of a circle equals $\frac{2}{12}$ of the same circle.

9. $\frac{2}{2}$ of a circle equals $\frac{7}{12}$ of the same circle.

10. Show by oblongs that $\frac{1}{2}$ of any oblong equals $\frac{3}{6}$ of the same oblong or $\frac{6}{12}$ of the same oblong.

11. Show that $\frac{1}{2}$ of any unit is greater in size than $\frac{5}{12}$ of the same unit.

12. How many halves of a unit are there in a unit? how many sixths? how many twelfths?

13. Arrange the following in order of their size:

$\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{12}$, $\frac{2}{2}$, $\frac{6}{6}$, $\frac{3}{2}$, $\frac{12}{6}$, $\frac{12}{12}$, $\frac{4}{2}$, $\frac{24}{12}$.

Written Work

1. Add $\frac{5}{6}$ and $\frac{5}{12}$.

$$\frac{5}{6} = \frac{10}{12}$$
$$\frac{5}{12} = \frac{5}{12}$$
$$\frac{15}{12} = 1\frac{3}{12}, \text{ or } 1\frac{1}{4}, \text{ Sum.}$$

Change the fraction $\frac{5}{6}$ to twelfths.
The sum of $\frac{10}{12}$ and $\frac{5}{12}$ is $\frac{15}{12}$, or $1\frac{3}{12}$, or $1\frac{1}{4}$.

2. Add $3\frac{5}{6}$ and $2\frac{5}{12}$.

$$3\frac{5}{6} = 3\frac{10}{12}$$
$$2\frac{5}{12} = 2\frac{5}{12}$$
$$6\frac{1}{4}, \text{ Sum.}$$

First add the fractions as above;
$\frac{15}{12} = 1\frac{1}{4}$. Write $\frac{1}{4}$ and carry the 1.
The sum of the whole numbers is
$1 + 2 + 3$, or 6. The sum is therefore $6\frac{1}{4}$.

3. From $\frac{5}{6}$ subtract $\frac{5}{12}$.

$$\frac{5}{6} = \frac{10}{12}$$
$$\frac{5}{12} = \frac{5}{12}$$
$$\frac{5}{12}, \text{ Difference.}$$

Change $\frac{5}{6}$ to twelfths.
The difference between $\frac{10}{12}$ and $\frac{5}{12}$ is $\frac{5}{12}$.

4. From $3\frac{5}{6}$ subtract $2\frac{5}{12}$.

$$3\frac{5}{6} = 3\frac{10}{12}$$
$$2\frac{5}{12} = 2\frac{5}{12}$$
$$1\frac{5}{12}, \text{ Difference.}$$

The difference between the fractions
is $\frac{5}{12}$.
The difference between the whole numbers is 1. The difference is therefore $1\frac{5}{12}$.

Add :

5. $\frac{1}{2} + \frac{1}{6}$ **6.** $\frac{1}{6} + \frac{5}{12}$ **7.** $1\frac{1}{2} + 2\frac{1}{6}$ **8.** $3\frac{7}{12} + 1\frac{1}{6}$

Subtract :

9. $\frac{1}{2} - \frac{1}{6}$ **10.** $\frac{5}{6} - \frac{5}{12}$ **11.** $3\frac{7}{12} - 1\frac{1}{2}$ **12.** $4\frac{5}{6} - 3\frac{1}{2}$

First add ; then subtract :

13. $8\frac{5}{12}$ **14.** $9\frac{11}{12}$ **15.** $7\frac{5}{6}$ **16.** $9\frac{7}{12}$ **17.** $12\frac{5}{6}$
    $2\frac{1}{6}$ $6\frac{5}{6}$ $5\frac{5}{12}$ $8\frac{1}{2}$ $10\frac{5}{12}$

18. $11\frac{1}{2}$ **19.** $6\frac{1}{2}$ **20.** $41\frac{5}{6}$ **21.** $16\frac{2}{3}$ **22.** $15\frac{7}{12}$
    $\underline{\;4\frac{1}{6}\;}$ $\underline{\;5\frac{1}{12}\;}$ $\underline{16\frac{7}{12}}$ $\underline{12\frac{1}{6}}$ $\underline{\;5\frac{1}{4}\;}$

23. Julia bought $\frac{1}{12}$ doz. pearl buttons and $\frac{5}{6}$ doz. bone buttons. What part of a dozen did she buy in all? How many buttons?
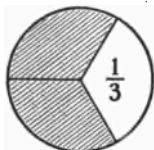
24. James worked $3\frac{5}{6}$ hr. on Saturday and $1\frac{1}{2}$ hr. on Monday. How many hours did he work both days? How many more hours did he work on Saturday than on Monday?

25. Robert's marks for the month average $91\frac{5}{6}$, and John's average $89\frac{1}{2}$. Find the difference in their averages.
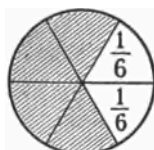
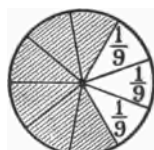### Thirds, Sixths, and Ninths

Oral Work

1 unit $=\frac{3}{3}$.   1 unit $=\frac{6}{6}$.   1 unit $=\frac{9}{9}$.

$\frac{1}{3}$ $=$ $\frac{2}{6}$ $=$ $\frac{3}{9}$

1. What is $\frac{1}{3}$ of 6? $\frac{1}{3}$ of 12? $\frac{1}{3}$ of 18? $\frac{2}{3}$ of 18?

2. What is $\frac{1}{6}$ of 6? $\frac{1}{6}$ of 12? $\frac{1}{6}$ of 18? $\frac{5}{6}$ of 18?

3. What is $\frac{1}{9}$ of 9? $\frac{1}{9}$ of 18? $\frac{1}{9}$ of 27? $\frac{4}{9}$ of 27?

4. Into how many equal parts is the first circle divided? the second circle? the third circle?

5. $\frac{1}{3}$ of a circle $=\frac{?}{6}$ of the circle $=\frac{?}{9}$ of the circle.

6. $\frac{2}{3}$ of a circle $=\frac{?}{6}$ of the circle $=\frac{?}{9}$ of the circle.

7. $\frac{3}{3}$ of a circle $= \frac{7}{6}$ of the circle $= \frac{7}{9}$ of the circle.

8. $\frac{1}{3} + \frac{2}{6} = \frac{7}{6}$; $\frac{1}{3} + \frac{3}{9} = \frac{7}{9}$; $\frac{1}{3} + \frac{3}{6} = \frac{7}{6}$.

9. $\frac{1}{3}$ of an hour $+ \frac{1}{6}$ of an hour $= \frac{7}{6}$ of an hour.

10. $\frac{2}{3}$ of a day $+ \frac{3}{9}$ of a day $= \frac{7}{9}$ of a day.

11. $\frac{1}{3} + \frac{1}{6} = —$; $\frac{1}{3} + \frac{1}{9} = —$; $\frac{1}{2} + \frac{1}{6} = —$; $\frac{2}{3} + \frac{1}{6} = —$.

12. Draw an oblong and show that $\frac{1}{3}$ of the oblong $= \frac{2}{6}$ of the oblong $= \frac{3}{9}$ of the oblong.

13. $\frac{1}{3} = \frac{?}{6}$; $\frac{2}{3} = \frac{?}{6}$; $\frac{2}{3} = \frac{?}{9}$; $\frac{3}{3} = \frac{?}{9}$.

14. Draw squares and show that $\frac{1}{3} = \frac{2}{6}$; that $\frac{2}{3} = \frac{4}{6}$; that $\frac{1}{3} = \frac{3}{9}$; that $\frac{2}{3} = \frac{6}{9}$.

15. How many thirds equal one unit? how many sixths? how many ninths?

16. $\frac{6}{3} =$ how many units? $\frac{12}{6} =$ how many units? $\frac{18}{6} =$ how many units? $\frac{9}{3} =$ how many units?

Fractional Parts of the Foot and the Yard

Oral Work

In the following diagrams of one foot and one yard, $\frac{1}{4}$ inch stands for 1 foot.

One foot.   *One yard.*
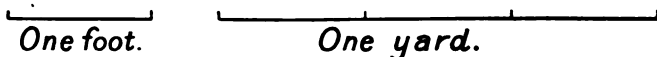
1. A foot is what part of a yard?

2. 2 feet are what part of a yard?

3. How many feet equal $\frac{1}{3}$ of a yard? $\frac{2}{3}$ of a yard?

4. Measure a yard on the blackboard. Divide the yard into feet. Divide a foot into inches.

5. How many inches equal $\frac{1}{2}$ of a foot? $\frac{2}{3}$ of a foot? $\frac{3}{4}$ of a foot? $1\frac{1}{2}$ ft.? $2\frac{1}{2}$ ft.?

6. 6 in. are what part of a foot? of 2 feet? of a yard?

7. 4 in. are what part of a foot? of 2 feet?

8. $1\frac{1}{2}$ ft. $+ 1\frac{1}{2}$ ft. $=$ — ft.

9. $\frac{1}{2} = \frac{?}{4}$; $\frac{1}{2} + \frac{1}{4} = \frac{?}{4}$; $\frac{1}{2} = \frac{?}{6}$; $\frac{1}{2} + \frac{3}{6} = \frac{?}{6}$.

10. $1\frac{1}{4}$ ft. $+ \frac{1}{2}$ ft. $=$ how many feet? $1\frac{1}{4} + \frac{1}{2} =$ —.

11. $\frac{1}{3}$ yd. $+ \frac{1}{2}$ yd. $+ \frac{1}{6}$ yd. $=$ — yd. $=$ — ft.

12. $2\frac{1}{3}$ ft. $+ 3\frac{2}{3}$ ft. $=$ — ft. $=$ — yd.

13. $\frac{3}{4}$ ft. $+ \frac{1}{4}$ ft. $=$ — ft.; $\frac{3}{4}$ ft. $+ \frac{3}{4}$ ft. $+ \frac{2}{4}$ ft. $=$ — ft.

14. $\frac{4}{2}$ ft. $=$ — ft.; $\frac{8}{3}$ ft. $=$ — ft.; $\frac{6}{4}$ ft. $=$ — ft.

Written Work

Add:

1. $2\frac{1}{4}$ in.	**2.** $5\frac{1}{6}$ yd.	**3.** $6\frac{1}{2}$ ft.	**4.** $2\frac{1}{3}$ ft.
$3\frac{1}{2}$ in.	$8\frac{1}{6}$ yd.	$2\frac{1}{4}$ ft.	$8\frac{1}{6}$ ft.

Subtract:

5. $3\frac{3}{4}$ ft.	**6.** $7\frac{1}{3}$ yd.	**7.** $8\frac{1}{3}$ ft.	**8.** $20\frac{1}{2}$ ft.
$2\frac{3}{4}$ ft.	$6\frac{1}{6}$ yd.	$2\frac{1}{6}$ ft.	$15\frac{1}{6}$ ft.

Review — Written Work

Add:

1. $11\frac{1}{8}$	**4.** $3\frac{1}{8}$	**7.** $29\frac{1}{2}$	**10.** $97\frac{3}{8}$	**13.** $10\frac{5}{8}$
$5\frac{1}{8}$	$2\frac{5}{6}$	$6\frac{1}{4}$	$\frac{4}{8}$	$\frac{1}{8}$
$2\frac{1}{2}$	$12\frac{1}{6}$	$18\frac{1}{2}$	$\frac{1}{4}$	$4\frac{1}{8}$
2. $6\frac{2}{3}$	**5.** $11\frac{1}{4}$	**8.** $17\frac{3}{4}$	**11.** $8\frac{1}{8}$	**14.** $80\frac{3}{4}$
$4\frac{1}{2}$	$5\frac{5}{8}$	$5\frac{5}{8}$	$3\frac{3}{4}$	$4\frac{1}{2}$
$2\frac{1}{3}$	$3\frac{1}{3}$	$4\frac{1}{4}$	$\frac{1}{2}$	$70\frac{1}{6}$
3. $6\frac{1}{2}$	**6.** $40\frac{1}{4}$	**9.** $90\frac{1}{6}$	**12.** $7\frac{1}{2}$	**15.** $24\frac{1}{8}$
$12\frac{3}{4}$	$16\frac{1}{2}$	$2\frac{1}{3}$	$4\frac{7}{8}$	$5\frac{3}{8}$
$2\frac{1}{3}$	$5\frac{1}{4}$	$7\frac{5}{6}$	$2\frac{1}{2}$	$3\frac{7}{8}$

Subtract:

16.	$25\frac{3}{8}$	21.	$87\frac{3}{4}$	26.	$80\frac{11}{12}$	31.	$57\frac{7}{8}$
	$17\frac{1}{6}$		$14\frac{1}{2}$		$16\frac{5}{6}$		$16\frac{3}{4}$

17.	$16\frac{7}{12}$	22.	$25\frac{1}{4}$	27.	$45\frac{5}{6}$	32.	$14\frac{7}{8}$
	$4\frac{1}{2}$		$16\frac{1}{8}$		$16\frac{1}{4}$		$10\frac{1}{2}$

18.	$19\frac{1}{2}$	23.	$37\frac{7}{8}$	28.	$17\frac{3}{4}$	33.	$13\frac{5}{8}$
	$16\frac{1}{6}$		$16\frac{3}{4}$		$16\frac{5}{8}$		$4\frac{3}{4}$

19.	$8\frac{7}{9}$	24.	$15\frac{5}{6}$	29.	$49\frac{1}{4}$	34.	$6\frac{3}{4}$
	$5\frac{2}{3}$		$13\frac{1}{4}$		$20\frac{3}{8}$		$4\frac{1}{2}$

20.	$13\frac{7}{8}$	25.	$20\frac{2}{3}$	30.	$16\frac{7}{8}$	35.	$27\frac{5}{8}$
	$10\frac{3}{4}$		$16\frac{1}{6}$		$12\frac{3}{4}$		$1\frac{1}{4}$

Fifths, Tenths, and Fifteenths

Oral Work

1 unit = $\frac{5}{5}$.   1 unit = $\frac{10}{10}$.   1 unit = $\frac{15}{15}$.
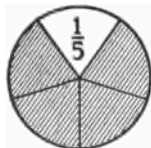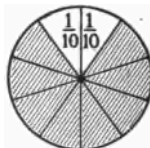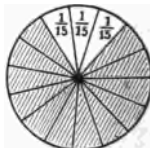
$\frac{1}{5}$ = $\frac{2}{10}$ = $\frac{3}{15}$

1. What is $\frac{2}{5}$ of 25? $\frac{3}{10}$ of 20? $\frac{2}{15}$ of 30?

2. Into how many equal parts is the first circle divided? the second circle? the third circle?

3. Observe the parts of each circle that are not shaded. $\frac{1}{5} = \frac{?}{10} = \frac{?}{15}$.

4. Then $\frac{2}{5} = \frac{?}{10} = \frac{?}{15}$; $\frac{3}{5} = \frac{?}{10} = \frac{?}{15}$; $\frac{4}{5} = \frac{?}{10} = \frac{?}{15}$.

5. Each of five boys had $\frac{1}{5}$ of a dollar. How many dollars did all have?

6. $\frac{2}{5}$ of a circle $+ \frac{2}{5}$ of the same circle $= \frac{?}{5}$ of the circle. Then $\frac{2}{5} + \frac{2}{5} = \frac{?}{5}$; $\frac{4}{5} - \frac{2}{5} = \frac{?}{5}$; $\frac{4}{5} - \frac{3}{5} = \frac{?}{5}$.

7. How many parts of a unit are there in $\frac{1}{5} + \frac{1}{5} + \frac{1}{5}$? in $\frac{2}{5} + \frac{2}{5}$? in $\frac{2}{10} + \frac{5}{10} + \frac{8}{10}$? in $\frac{3}{15} + \frac{8}{15} + \frac{3}{15}$? in $\frac{8}{15} - \frac{3}{15}$?

8. $\frac{1}{5} + \frac{1}{10} = \frac{?}{10}$; $\frac{1}{5} + \frac{1}{15} = \frac{?}{15}$; $\frac{1}{5} + \frac{1}{5} = \frac{?}{15}$.

9. $\frac{5}{5} + \frac{5}{5} = \frac{?}{5}$. Then $\frac{10}{5} =$ how many units?

10. $\frac{8}{5} =$ how many units and $\frac{3}{5}$ remaining?

11. $\frac{12}{5} =$ how many units and $\frac{2}{5}$ remaining?

12. $\frac{15}{10} =$ how many units and $\frac{5}{10}$ remaining?

13. Change to units and parts of units: $\frac{6}{5}, \frac{9}{5}, \frac{11}{5}, \frac{13}{10}$.

Written Work

Add:

1. $\$2\frac{1}{5}$	**2.** $\$11\frac{1}{5}$	**3.** $25\frac{2}{5}$ mi.	**4.** $5\frac{1}{15}$
$3\frac{1}{10}$	$5\frac{3}{10}$	$4\frac{1}{10}$ mi.	$4\frac{1}{5}$

5. $24\frac{1}{5}$ mi.	**6.** $\$23\frac{1}{5}$	**7.** $50\frac{1}{5}$	**8.** $24\frac{1}{5}$ da.
$4\frac{1}{15}$ mi.	$7\frac{3}{10}$	$35\frac{2}{15}$	$3\frac{3}{10}$ da.
$5\frac{1}{5}$ mi.	$31\frac{1}{10}$	$4\frac{4}{5}$	$4\frac{1}{5}$ da.

Subtract:

9. $\$3\frac{1}{5}$	**10.** $25\frac{1}{5}$ hr.	**11.** $\$14\frac{2}{5}$	**12.** $78\frac{2}{5}$ min.
$2\frac{1}{10}$	$13\frac{1}{15}$ hr.	$10\frac{1}{10}$	$42\frac{1}{15}$ min.

13. James works in his school garden $1\frac{1}{10}$ hours each day; John works $2\frac{1}{5}$ hours; and Frank, $1\frac{3}{10}$ hours. How many hours do they all work?

14. Jane walks to school in $\frac{1}{5}$ hr. and Martha in $\frac{1}{10}$ hr. What part of an hour longer does it take Jane than Martha? how many minutes longer?

15. From Philip's house to school it is $\frac{2}{5}$ mi.; to the ball grounds it is $\frac{1}{10}$ mi. further. How far is it from Philip's house to the ball grounds?

16. Mary earns \$$\frac{3}{10}$, Henry earns \$$\frac{2}{5}$, and Rose earns \$$\frac{1}{5}$. What part of a dollar do they earn together?

Add:

17. $3\frac{3}{5}$	**19.** $2\frac{1}{5}$	**21.** $1\frac{7}{10}$	**23.** $3\frac{7}{15}$
$2\frac{1}{15}$	$3\frac{7}{10}$	$2\frac{4}{5}$	$2\frac{4}{5}$
18. $3\frac{4}{15}$	**20.** $5\frac{2}{5}$	**22.** $3\frac{1}{15}$	**24.** $3\frac{9}{10}$
$3\frac{2}{5}$	$7\frac{3}{10}$	$4\frac{1}{5}$	$2\frac{1}{5}$

Subtract:

25. $5\frac{4}{5}$	**26.** $3\frac{3}{10}$	**27.** $2\frac{9}{10}$	**28.** $3\frac{7}{15}$
$2\frac{1}{10}$	$1\frac{1}{5}$	$1\frac{3}{5}$	$2\frac{1}{5}$

Halves, Fourths, and Sixteenths

Oral Work

1 unit $= \frac{2}{2}$.   1 unit $= \frac{4}{4}$.   1 unit $= \frac{16}{16}$.

$$\frac{1}{2} \quad = \quad \frac{2}{4} \quad = \quad \frac{8}{16}$$

1. How do these three units compare in size?

2. Into how many equal parts is the first square divided? the second square? the third square?

3. $\frac{1}{2}$ of the first square = — fourths of the second square = — sixteenths of the third square.

4. $\frac{2}{2}$ = — unit; $\frac{4}{4}$ = — unit; $\frac{8}{8}$ = — unit; $\frac{16}{16}$ = — unit.

5. $\frac{1}{2} = \frac{?}{4} = \frac{?}{8} = \frac{?}{16}$.   **6.** $\frac{1}{4} = \frac{?}{8} = \frac{?}{16}$.

7. $\frac{2}{4} = \frac{?}{8} = \frac{?}{16}$; $\frac{3}{4} = \frac{?}{8} = \frac{?}{16}$.

8. $\frac{1}{8} = \frac{?}{16}$; $\frac{2}{8} = \frac{?}{16} = \frac{?}{4}$; $\frac{4}{8} = \frac{?}{16} = \frac{?}{2}$; $\frac{6}{8} = \frac{?}{16} = \frac{?}{4}$.

9. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{?}{8}$; $\frac{1}{4} + \frac{3}{8} + \frac{3}{16} = \frac{?}{16}$; $\frac{9}{16} - \frac{1}{4} = \frac{?}{16}$.

Written Work

Add:

1. $3\frac{1}{16}$ ft.	**2.** \$$16\frac{1}{2}$	**3.** $12\frac{1}{4}$	**4.** $10\frac{3}{16}$
$5\frac{1}{4}$ ft.	$20\frac{3}{4}$	$14\frac{1}{2}$	$5\frac{1}{2}$
$2\frac{1}{2}$ ft.	$17\frac{1}{16}$	$10\frac{5}{16}$	$6\frac{3}{4}$
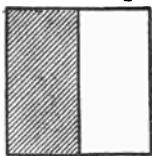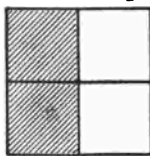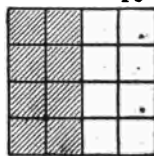
Subtract:

5. \$$12\frac{1}{4}$	**6.** $23\frac{3}{4}$ yd.	**7.** $13\frac{1}{2}$ mi.	**8.** $68\frac{3}{4}$
$8\frac{1}{16}$	$18\frac{3}{16}$ yd.	$9\frac{3}{16}$ mi.	$52\frac{5}{16}$

9. A flower bed is $4\frac{1}{2}$ ft. long and $3\frac{1}{4}$ ft. wide. Find the distance around it.

10. The school ground is in the form of a square, $13\frac{1}{2}$ rd. on a side. Find the distance in rods around it.

11. I cut $\frac{1}{2}$ yd. of ribbon from $3\frac{3}{4}$ yd. How much ribbon have I left?

12. A stick $5\frac{3}{16}$ in. long is broken in two pieces. One piece is $3\frac{1}{8}$ in. long. How long is the other piece?

13. I pay \$$3\frac{1}{2}$ for a chair, and \$$4\frac{3}{4}$ for a table. What is my total bill?

Thirds, Sixths, and Twelfths

Oral Work

$$1 \text{ unit} = \tfrac{3}{3} = \tfrac{6}{6} = \tfrac{12}{12}.$$

1. Show by the diagram how many sixths are equal to one third; how many twelfths are equal to one sixth.

2. $\frac{1}{3} = \frac{?}{6} = \frac{?}{12}$; $\frac{2}{3} = \frac{?}{6} = \frac{?}{12}$.

3. Cut a paper oblong and fold it into thirds; into sixths; into twelfths.

4. $\frac{1}{6}$ hour $= \frac{?}{12}$ of an hour; $\frac{1}{6}$ hour $= \frac{?}{12}$ of an hour.

5. Change $\frac{1}{3}$ and $\frac{1}{6}$ to twelfths. Change $\frac{4}{12}$ to thirds.

6. Cut three oblongs of the same size out of paper. Fold the first oblong into thirds; the second oblong into sixths; and the third oblong into twelfths.

7. Change $\frac{2}{3}$ and $\frac{5}{6}$ to twelfths. Change $\frac{6}{12}$ to sixths.

8. $\frac{4}{12}$ of an oblong equal how many thirds of the oblong?

9. $\frac{12}{12}$ equal how many units; $\frac{12}{6}$ equal how many units?

Add:

10. $\frac{1}{3}, \frac{1}{6}, \frac{1}{12}$	**15.** $3\frac{1}{3}, 4\frac{1}{6}$	**20.** $3\frac{1}{3}, 3\frac{1}{6}, 2\frac{1}{12}$
11. $\frac{2}{3}, \frac{1}{6}, \frac{1}{12}$	**16.** $2\frac{2}{3}, 3\frac{1}{12}$	**21.** $2\frac{1}{6}, 2\frac{1}{3}, 2\frac{5}{6}$
12. $\frac{2}{3}, \frac{1}{12}, \frac{5}{12}$	**17.** $4\frac{1}{6}, 5\frac{1}{12}$	**22.** $2\frac{1}{12}, 2\frac{1}{6}, \frac{1}{3}$
13. $\frac{1}{3}, \frac{5}{6}, \frac{1}{12}$	**18.** $5\frac{1}{12}, 6\frac{2}{3}$	**23.** $3\frac{1}{6}, 2\frac{7}{12}, 5\frac{5}{12}$
14. $\frac{1}{3}, \frac{7}{12}, \frac{5}{6}$	**19.** $7\frac{1}{6}, 8\frac{2}{3}$	**24.** $3\frac{1}{3}, 4\frac{1}{6}, 5\frac{1}{12}$

Written Work

1. Change to units and parts of units : $\frac{8}{2}$, $\frac{9}{6}$, $\frac{10}{8}$, $\frac{12}{6}$, $\frac{15}{10}$, $\frac{8}{6}$, $\frac{18}{16}$, $\frac{18}{16}$, $\frac{20}{16}$.

Add:

2. $29\frac{1}{8}$	**4.** $7\frac{1}{4}$	**6.** $39\frac{1}{4}$	**8.** $5\frac{1}{4}$
$32\frac{1}{6}$	1●	$4\frac{5}{12}$	$6\frac{5}{8}$
$45\frac{5}{12}$	$25\frac{1}{12}$	$23\frac{2}{8}$	$12\frac{7}{12}$

3. $27\frac{5}{12}$ ft.	**5.** $15\frac{7}{12}$ mi.	**7.** $14\frac{1}{12}$ doz.	**9.** $12\frac{1}{4}$ da.
$45\frac{1}{8}$ ft.	$29\frac{2}{8}$ mi.	$19\frac{1}{2}$ doz.	$10\frac{1}{6}$ da.
$25\frac{5}{8}$ ft.	$31\frac{5}{8}$ mi.	$16\frac{5}{8}$ doz.	$13\frac{1}{12}$ da.

Subtract:

10. $8\frac{1}{8}$	**12.** $17\frac{1}{8}$	**14.** $14\frac{2}{8}$	**16.** $32\frac{5}{12}$
$6\frac{1}{12}$	$15\frac{1}{12}$	$12\frac{1}{12}$	$30\frac{1}{8}$

11. $7\frac{2}{8}$ ft.	**13.** $9\frac{2}{8}$ mi.	**15.** $10\frac{1}{8}$ doz.	**17.** $15\frac{11}{12}$
$5\frac{5}{12}$ ft.	$7\frac{1}{12}$ mi.	$6\frac{1}{2}$ doz.	$5\frac{2}{8}$

18. The floor of a room is $13\frac{5}{8}$ ft. long and $12\frac{1}{8}$ ft. wide. Find the distance around the room. How much longer is the room than it is wide?

19. Mary's hair ribbon is $15\frac{1}{8}$ in. long and $1\frac{1}{8}$ in. wide. Find the difference between the length and the width of the ribbon.

20. James worked after school $1\frac{5}{8}$ hr. Monday, $1\frac{1}{6}$ hr. Tuesday, $1\frac{1}{12}$ hr. Wednesday, 2 hr. Thursday, and $1\frac{5}{8}$ hr. Friday. On Saturday he worked $10\frac{1}{8}$ hr. How many hours did he work during the week?

21. Walter lives $1\frac{2}{8}$ mi. from school, and Peter $1\frac{1}{6}$ mi. in the same direction. In going to school, Walter walks how much farther than Peter? Find the distance both walk in going to and coming from school in a day.

Fourths, Eighths, and Sixteenths

Oral Work

1. Show by the diagram how many eighths are equal to one fourth; how many sixteenths are equal to one eighth; how many sixteenths are equal to one fourth.

2. $\frac{2}{8} = \frac{?}{16}$; $\frac{2}{8} = \frac{?}{4}$; $\frac{4}{16} = \frac{?}{4}$; $\frac{4}{16} = \frac{?}{8}$.

3. Any unit can be divided into how many halves? 3ds? 4ths? 5ths? 6ths? 7ths? 8ths? 10ths? 16ths? 24ths?

4. Add $\frac{1}{4}$ and $\frac{1}{8}$; $\frac{1}{8}$ and $\frac{1}{16}$. From $\frac{7}{8}$ take $\frac{1}{4}$.

5. From $\frac{9}{16}$ take $\frac{1}{8}$; $\frac{1}{4}$; $\frac{1}{2}$; $\frac{3}{8}$.

6. $\frac{5}{4}$ means that a unit ($\frac{4}{4}$) and a part of a unit ($\frac{1}{4}$) have been added. What does $\frac{9}{8}$ mean? $\frac{17}{16}$?

Written Work

Add :

1. $18\frac{1}{4}$ in.	**2.** $15\frac{1}{16}$	**3.** $19\frac{1}{4}$	**4.** $40\frac{7}{8}$
$20\frac{1}{8}$ in.	$27\frac{1}{8}$	$32\frac{3}{16}$	$30\frac{1}{16}$
$39\frac{1}{16}$ in.	$41\frac{3}{4}$	$20\frac{1}{8}$	$18\frac{1}{4}$

Subtract :

5. $9\frac{1}{8}$ in.	**6.** $14\frac{1}{4}$ da.	**7.** $28\frac{11}{16}$	**8.** $39\frac{7}{16}$
$7\frac{1}{16}$ in.	$7\frac{1}{8}$ da.	$13\frac{3}{8}$	$8\frac{1}{4}$

1. Notice in the diagram on p. 260 that $\frac{1}{4} = \frac{4}{16}$. By what number are both numerator and denominator of $\frac{1}{4}$ *multiplied* to change it to $\frac{4}{16}$? Is there any difference in *value* between $\frac{1}{4}$ and $\frac{4}{16}$? Notice that the *terms* in $\frac{4}{16}$ are larger or *higher* than in $\frac{1}{4}$. The changing of $\frac{1}{4}$ to the equal fraction $\frac{4}{16}$ is called **changing or reducing $\frac{1}{4}$ to higher terms.**

2. By what number must both terms of $\frac{4}{16}$ be *divided* to change $\frac{4}{16}$ to $\frac{1}{4}$? Is there any difference in *value* between $\frac{4}{16}$ and $\frac{1}{4}$? Which fraction has the *lower terms?* The change of $\frac{4}{16}$ to $\frac{1}{4}$ is called **reducing $\frac{4}{16}$ to lower terms.**

3. Notice in the diagram that $\frac{4}{16} = \frac{2}{8} = \frac{1}{4}$. When $\frac{4}{16}$ is changed to $\frac{2}{8}$ it is reduced to *lower* terms but not to its *lowest terms*, since $\frac{2}{8}$ can be changed to still lower terms, $\frac{1}{4}$. Can $\frac{1}{4}$ be reduced to still lower terms? The change of $\frac{4}{16}$ to $\frac{1}{4}$ is called **reducing $\frac{4}{16}$ to its lowest terms.**

4. By what number must both terms of $\frac{1}{2}$ be multiplied to change it to the equal fraction $\frac{3}{6}$? By what number must both terms of $\frac{8}{10}$ be divided to change it to the equal frac-tion $\frac{4}{5}$? Is $\frac{4}{5}$ in its lowest terms?

The value of a fraction is not changed when both terms are multiplied by the same number, or when both terms are divided by the same number.

Read in lowest terms at sight :

5. $\frac{2}{4}$; $\frac{8}{16}$; $\frac{6}{8}$; $\frac{3}{4}$; $\frac{12}{16}$; $\frac{10}{15}$; $\frac{7}{9}$; $\frac{2}{6}$; $\frac{9}{12}$; $\frac{9}{15}$; $\frac{6}{8}$; $\frac{8}{10}$; $\frac{4}{6}$.

6. $\frac{6}{9}$; $\frac{6}{10}$; $\frac{7}{8}$; $\frac{4}{12}$; $\frac{7}{16}$; $\frac{6}{14}$; $\frac{7}{14}$; $\frac{4}{10}$; $\frac{9}{10}$; $\frac{12}{16}$; $\frac{4}{16}$; $\frac{10}{12}$.

The fractions which we have been studying show that *any unit* may be divided into any number of equal parts and any part may be used as a *unit of measure*. Just as $10 \not\!c$ means $10 \times 1 \not\!c$, the *unit of measure*, so $\frac{3}{4}$ means $3 \times \frac{1}{4}$, the *unit of measure.*

Oral Work

A fraction is changed to **higher terms** when it is changed to a fraction having a *larger denominator*.

Thus, $\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$.

A fraction is changed to **lower terms** when it is changed to a fraction having a *smaller denominator*.

Thus, $\frac{8}{16} = \frac{4}{8} = \frac{2}{4} = \frac{1}{2}$.

Give the equivalents called for and explain the steps in the work.   Thus, dividing both terms of $\frac{8}{12}$ by 4 gives $\frac{2}{3}$; multiplying both terms of $\frac{2}{3}$ by 4 gives $\frac{8}{12}$.

1. $\frac{1}{4} = \frac{?}{8} = \frac{?}{16} = \frac{?}{24}$.   2. $\frac{3}{3} = \frac{?}{6} = \frac{?}{9} = \frac{?}{12} = \frac{?}{18}$.

3. $\frac{3}{4} = \frac{?}{8} = \frac{?}{12} = \frac{?}{16} = \frac{?}{20} = \frac{?}{24} = \frac{?}{28} = \frac{?}{32}$.

Change :

4. $\frac{2}{6}$ to thirds.   9. $\frac{1}{3}$ to ninths.

5. $\frac{4}{12}$ to thirds.   10. $\frac{3}{4}$ to twelfths.

6. $\frac{5}{10}$ to halves.   11. $\frac{2}{5}$ to tenths.

7. $\frac{3}{18}$ to sixths.   12. $\frac{2}{3}$ to sixths.

8. $\frac{4}{16}$ to fourths.   13. $\frac{3}{4}$ to eighths.

14. Change $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{5}{6}$, $\frac{7}{12}$, $\frac{5}{8}$, $\frac{5}{12}$, each to twenty-fourths.

15. Change $\frac{10}{12}$, $\frac{15}{18}$, $\frac{16}{24}$, $\frac{10}{30}$, $\frac{12}{24}$, $\frac{25}{30}$, each to sixths.

Change :

16. $\frac{3}{6}$ to halves.   22. $\frac{6}{8}$ to twelfths.

17. $\frac{3}{12}$ to fourths.   23. $\frac{1}{2}$ to eighths.

18. $\frac{2}{20}$ to tenths.   24. $\frac{4}{5}$ to tenths.

19. $\frac{2}{16}$ to eighths.   25. $\frac{2}{3}$ to fifteenths.

20. $\frac{5}{25}$ to fifths.   26. $\frac{3}{4}$ to sixteenths.

21. $\frac{4}{12}$ to sixths.   27. $\frac{5}{8}$ to twenty-fourths.

Oral and Written Work

1. Divide 10, 12, 24, 36, 38, and 50, each by 2. Divide other numbers ending in 2, 4, 6, 8, or 0 by 2.

A number is divisible by 2, if the ones' figure is 2, 4, 6, 8, or 0.

Change to lowest terms :

2. $\frac{8}{12}$, $\frac{6}{24}$, $\frac{20}{24}$, $\frac{24}{32}$, $\frac{22}{40}$, $\frac{28}{40}$, $\frac{16}{30}$, $\frac{17}{20}$, $\frac{9}{10}$.

3. Change $\frac{36}{40}$ to lowest terms. Thus, $\frac{36}{40} = \frac{18}{20} = \frac{9}{10}$. Or, if you notice that 4 divides both 36 and 40, you may divide these numbers by 4 and say at once $\frac{36}{40} = \frac{9}{10}$.

4. Divide 15, 25, 40, 125, 150, each by 5. What is the ones' figure in each dividend ? Divide other numbers ending in 5, or 0, by 5.

A number is divisible by 5, if its ones' figure is 5 or 0.

Change to lowest terms :

5. $\frac{15}{20}$, $\frac{10}{40}$, $\frac{25}{40}$, $\frac{30}{35}$, $\frac{45}{60}$, $\frac{20}{40}$, $\frac{50}{150}$, $\frac{15}{60}$.

A number is divisible by 3 if the sum of its digits, or figures, is divisible by 3. Thus, 216 is divisible by 3, since $2 + 1 + 6$, or 9, is divisible by 3.

A number is divisible by 9 if the sum of its digits is divisible by 9. Thus, 369 is divisible by 9, since $3 + 6 + 9$, or 18, is divisible by 9.

6. Name the numbers to 63 that are divisible by 9 ; by 3.

7. Change to lowest terms :

$\frac{36}{54}$, $\frac{15}{36}$, $\frac{12}{42}$, $\frac{54}{135}$, $\frac{27}{54}$, $\frac{105}{120}$, $\frac{36}{36}$, $\frac{120}{360}$, $\frac{126}{174}$, $\frac{72}{144}$, $\frac{48}{96}$, $\frac{75}{153}$.

Change to fractions in their lowest terms :

8. $\frac{81}{144}$ $\frac{120}{140}$ $\frac{108}{132}$ $\frac{108}{126}$ $\frac{99}{132}$ $\frac{72}{108}$

9. $\frac{60}{144}$ $\frac{90}{140}$ $\frac{105}{360}$ $\frac{144}{288}$ $\frac{144}{156}$ $\frac{120}{132}$

10. $\frac{100}{225}$ $\frac{75}{105}$ $\frac{220}{400}$ $\frac{80}{128}$ $\frac{216}{264}$ $\frac{156}{188}$

How to change improper fractions to whole or mixed numbers

Oral Work

1. Name the whole numbers and the fractions in 5, $\frac{15}{2}$, $\frac{7}{4}$ ft., $\frac{84}{8}$ lb., $20, $\frac{25}{5}$ yd., 10 oz., $\frac{22}{7}$ in.

2. In changing $\frac{7}{4}$ to integers and fractions, think first how many fourths it takes to make one whole unit. Then $\frac{7}{4}$ = how many whole units, and $\frac{3}{4}$ remaining?

A fraction equal to or greater than one whole unit is an **improper fraction.**

3. Which of the following fractions are equal to 1? Which are greater than 1? Which are less than 1?

$\frac{1}{2}$, $\frac{2}{2}$, $\frac{3}{2}$, $\frac{4}{2}$; $\frac{1}{4}$, $\frac{2}{4}$, $\frac{4}{4}$, $\frac{7}{4}$; $\frac{1}{5}$, $\frac{3}{5}$, $\frac{5}{5}$, $\frac{8}{5}$; $\frac{3}{8}$, $\frac{3}{8}$, $\frac{8}{8}$, $\frac{7}{8}$; $\frac{1}{16}$, $\frac{7}{16}$, $\frac{15}{16}$, $\frac{19}{16}$.

Change to mixed numbers or integers:

4. $\frac{45}{8}$	**19.** $\frac{86}{7}$	**34.** $\frac{75}{12}$ doz.
5. $\frac{25}{4}$	**20.** $\frac{69}{7}$	**35.** $\frac{75}{12}$ wk.
6. $\frac{87}{9}$	**21.** $\frac{75}{6}$	**36.** $\frac{93}{12}$ rd.
7. $\frac{46}{5}$	**22.** $\frac{98}{12}$	**37.** $\frac{84}{8}$ bu.
8. $\frac{29}{3}$	**23.** $\frac{143}{12}$	**38.** $\frac{110}{10}$ sq. yd.
9. $\frac{65}{8}$	**24.** $\frac{224}{11}$	**39.** $\frac{116}{10}$ A.
10. $\frac{75}{9}$	**25.** $\frac{120}{15}$ da.	**40.** $\frac{85}{4}$ lb.
11. $\frac{65}{7}$	**26.** $\frac{49}{5}$ sec.	**41.** $\frac{125}{10}$ min.
12. $\frac{56}{8}$	**27.** $\frac{89}{12}$ hr.	**42.** $\frac{110}{2}$ oz.
13. $\frac{102}{8}$	**28.** $\frac{83}{16}$ min.	**43.** $\frac{80}{16}$ lb.
14. $\frac{79}{7}$	**29.** $\frac{87}{8}$ in.	**44.** $\frac{109}{12}$ da.
15. $\frac{45}{3}$	**30.** $\frac{100}{16}$ bu.	**45.** $\frac{63}{4}$ in.
16. $\frac{95}{15}$	**31.** $\frac{105}{8}$ oz.	**46.** $\frac{103}{16}$ lb.
17. $\frac{64}{16}$	**32.** $\frac{99}{12}$ in.	**47.** $\frac{87}{10}$ min.
18. $\frac{96}{12}$	**33.** $\frac{84}{8}$ mi.	**48.** $\frac{107}{8}$ bu.

How to change whole or mixed numbers to improper fractions.

Oral Work

1. Change 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, each to the fractional unit 4ths; to 5ths; to 6ths; to 7ths. Thus, $1 = \frac{4}{4}$, $2 = \frac{8}{4}$, etc.

2. Change $1\frac{1}{2}$, $1\frac{3}{4}$, $2\frac{3}{5}$, $3\frac{5}{7}$, $2\frac{7}{8}$, $8\frac{3}{10}$, $9\frac{6}{11}$, $10\frac{5}{12}$, each to the fractional units indicated by the fraction of the mixed numbers. Thus, $1\frac{1}{2} = \frac{3}{2}$.

3. What kind of fractions are $\frac{3}{2}$, $\frac{7}{4}$, $\frac{13}{5}$?

Read as improper fractions:

	a	b	c	d	e	f	g	h	i
4.	$4\frac{3}{4}$	$6\frac{7}{8}$	$2\frac{4}{5}$	$3\frac{2}{3}$	$9\frac{1}{10}$	$4\frac{7}{12}$	$6\frac{3}{8}$	$10\frac{5}{8}$	$9\frac{1}{4}$
5.	$4\frac{2}{3}$	$5\frac{3}{4}$	$5\frac{4}{6}$	$2\frac{5}{12}$	$4\frac{8}{11}$	$2\frac{1}{10}$	$2\frac{1}{8}$	$4\frac{6}{7}$	$5\frac{4}{5}$
6.	$4\frac{3}{8}$	$3\frac{7}{12}$	$9\frac{1}{4}$	$8\frac{5}{6}$	$7\frac{2}{3}$	$9\frac{3}{10}$	$7\frac{5}{12}$	$4\frac{8}{10}$	$6\frac{4}{5}$

Written Work

1. Change $10\frac{7}{16}$ to an improper fraction.

$$10\frac{7}{16}$$
$$16$$
$$\overline{160}$$

Since 1 unit = $\frac{16}{16}$, 10 units = $10 \times \frac{16}{16}$, or $\frac{160}{16}$; $\frac{160}{16} + \frac{7}{16} = \frac{167}{16}$.

$$7$$
$$\overline{167}$$
$$\overline{16}$$

Change to improper fractions:

2. $15\frac{2}{3}$	**8.** $51\frac{2}{11}$	**14.** $85\frac{5}{16}$	**20.** $42\frac{11}{25}$
3. $17\frac{3}{4}$	**9.** $60\frac{5}{12}$	**15.** $92\frac{2}{3}$	**21.** $71\frac{7}{15}$
4. $18\frac{5}{6}$	**10.** $45\frac{3}{10}$	**16.** $85\frac{7}{12}$	**22.** $83\frac{7}{8}$
5. $25\frac{5}{7}$	**11.** $56\frac{9}{14}$	**17.** $48\frac{13}{20}$	**23.** $65\frac{11}{17}$
6. $35\frac{7}{8}$	**12.** $75\frac{3}{15}$	**18.** $78\frac{8}{16}$	**24.** $28\frac{23}{25}$
7. $42\frac{7}{9}$	**13.** $40\frac{9}{10}$	**19.** $80\frac{11}{50}$	**25.** $47\frac{7}{8}$

How to make fractions similar.

Oral Work

Fractions like $\frac{1}{5}$, $\frac{2}{5}$, and $\frac{4}{5}$, which have the same denominator, are said to have a **common denominator** (c. d.).

Fractions that have a common denominator are called **similar fractions.**

Notice that $\frac{1}{2}$ and $\frac{1}{3}$ may be changed to similar fractions by changing them to fractions having the common denominator, 6, or 12, or 18, or 24, etc.

$$\text{Thus, } \tfrac{1}{2} = \tfrac{3}{6}; \quad \tfrac{1}{3} = \tfrac{2}{6}.$$
$$\text{Or, } \quad \tfrac{1}{2} = \tfrac{6}{12}; \quad \tfrac{1}{3} = \tfrac{4}{12}.$$
$$\text{Or, } \quad \tfrac{1}{2} = \tfrac{9}{18}; \quad \tfrac{1}{3} = \tfrac{6}{18}.$$

1. Is any denominator less than 6 a common denominator of $\frac{1}{2}$ and $\frac{1}{3}$? Then what is the **least common denominator** (l. c. d.) of $\frac{1}{2}$ and $\frac{1}{3}$?

2. Since 4 is the least number that contains 2 and 4, 4 is the least common denominator of $\frac{1}{2}$ and $\frac{1}{4}$. For the same reason, the least common denominator of $\frac{1}{2}$ and $\frac{1}{5}$ is 10 ; of $\frac{1}{4}$ and $\frac{1}{8}$ is 8; of $\frac{2}{3}$ and $\frac{3}{4}$ is 12; of $\frac{2}{5}$ and $\frac{1}{10}$ is 10, etc.

3. Name some common denominators of $\frac{1}{4}$ and $\frac{1}{6}$. Name their least common denominator.

4. What is the least common denominator of $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$; of $\frac{1}{2}$, $\frac{1}{6}$, and $\frac{1}{12}$? What is the least common denominator of $\frac{1}{3}$, $\frac{1}{6}$, and $\frac{1}{9}$? (Notice that 6 is not contained in 9. Hence the least common denominator is 18.)

When you **cannot find the l. c. d. by inspection, try multiples of the largest denominator until you find one in which each of the other denominators is exactly contained. Thus, in 2, 6, 8, try 16, 24.**

NOTE. In finding the l. c. d. of 2, 6, 8, the 2 may be ignored, since any multiple of 6 must be a multiple of 2. Similarly, in 3, 5, 12, the 3 may be ignored; in 3, 5, 20, the 5 may be ignored, etc.

Find the least common denominators :

DENOMINATORS	LEAST COMMON DENOMINATOR	DENOMINATORS	LEAST COMMON DENOMINATOR
5. 3, 5, 10	——	**13.** 4, 3, 12	——
6. 2, 6, 9	——	**14.** 16, 3, 2	——
7. 3, 4, 2	——	**15.** 12, 5, 4	——
8. 8, 9, 6	——	**16.** 14, 2, 7	——
9. 2, 5, 3	——	**17.** 14, 2, 3	——
10. 3, 8, 4	——	**18.** 11, 12	——
11. 3, 9, 15	——	**19.** 3, 7, 9	——
12. 5, 4, 10	——	**20.** 11, 4, 2	——

Change to similar fractions:

21. $\frac{1}{4}, \frac{1}{3}$ **23.** $\frac{1}{2}, \frac{1}{3}$ **25.** $\frac{1}{4}, \frac{1}{12}$ **27.** $\frac{1}{12}, \frac{1}{8}$ **29.** $\frac{1}{6}, \frac{1}{9}$

22. $\frac{1}{4}, \frac{1}{6}$ **24.** $\frac{1}{5}, \frac{1}{4}$ **26.** $\frac{1}{3}, \frac{1}{15}$ **28.** $\frac{1}{8}, \frac{1}{9}$ **30.** $\frac{1}{15}, \frac{1}{5}$

Written Work

1. Change $\frac{3}{4}$, $\frac{7}{10}$, and $\frac{2}{5}$ to similar fractions having the least common denominator.

l. c. d., 20

$$\frac{3 \times 5}{4 \times 5} = \frac{15}{20}$$
$$\frac{2 \times 4}{5 \times 4} = \frac{8}{20}$$
$$\frac{7 \times 2}{10 \times 2} = \frac{14}{20}$$

You see at once that the l. c. d. is 20.

To change $\frac{1}{4}$ to 20ths, divide the required denominator, 20, by the given denominator, 4.

Multiply both terms by the quotient, 5.

Proceed in the same way with the other fractions.

Change to similar fractions having the l. c. d. :

2. $\frac{5}{8}, \frac{2}{3}$ **8.** $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ **14.** $\frac{9}{16}, \frac{7}{20}, \frac{1}{4}$ **20.** $\frac{5}{12}, \frac{5}{8}, \frac{3}{4}$

3. $\frac{3}{4}, \frac{5}{6}$ **9.** $\frac{1}{6}, \frac{2}{3}, \frac{3}{4}$ **15.** $\frac{5}{9}, \frac{5}{12}, \frac{2}{3}$ **21.** $\frac{1}{12}, \frac{2}{4}, \frac{2}{3}$

4. $\frac{5}{9}, \frac{5}{18}$ **10.** $\frac{1}{2}, \frac{3}{8}, \frac{1}{5}$ **16.** $\frac{5}{6}, \frac{4}{9}, \frac{5}{12}$ **22.** $\frac{1}{20}, \frac{1}{2}, \frac{3}{5}$

5. $\frac{2}{3}, \frac{3}{4}$ **11.** $\frac{2}{4}, \frac{2}{5}, \frac{3}{7}$ **17.** $\frac{3}{10}, \frac{3}{5}, \frac{1}{2}$ **23.** $\frac{6}{7}, \frac{2}{4}, \frac{1}{8}$

6. $\frac{5}{6}, \frac{3}{8}$ **12.** $\frac{7}{8}, \frac{9}{6}, \frac{3}{10}$ **18.** $\frac{5}{16}, \frac{7}{8}, \frac{9}{32}$ **24.** $\frac{3}{8}, \frac{1}{7}, \frac{1}{2}$

7. $\frac{9}{10}, \frac{3}{5}$ **13.** $\frac{5}{12}, \frac{4}{5}, \frac{2}{3}$ **19.** $\frac{3}{16}, \frac{2}{4}, \frac{3}{8}$ **25.** $\frac{5}{6}, \frac{4}{7}, \frac{1}{5}$

Oral Work

1. Can you add $\frac{2}{6}$ and $\frac{1}{6}$? Can you add $\frac{1}{3}$ and $\frac{1}{6}$ without change? What change must be made in $\frac{1}{3}$ and $\frac{1}{6}$ before they can be added? in $\frac{2}{3}$ and $\frac{1}{4}$?

2. $\frac{1}{5} = \frac{?}{10}$; $\frac{2}{5} = \frac{?}{10}$; $\frac{3}{5} = \frac{?}{10}$; $\frac{6}{5} = \frac{?}{10}$.

3. $\frac{1}{2} = \frac{?}{10}$; $\frac{1}{2} + \frac{1}{5} = \frac{?}{10}$; $\frac{1}{2} + \frac{1}{3} = \frac{?}{6}$; $\frac{1}{2} + \frac{1}{8} = \frac{?}{8}$.

4. Can you add $\frac{1}{2}$ and $\frac{1}{5}$ without change? Change both fractions to tenths. Can they then be added?

5. Can you add $\frac{1}{2}$ and $\frac{1}{3}$ without change? Change both fractions to sixths. Can they then be added?

6. When $\frac{1}{2}$ and $\frac{1}{4}$ are to be added, to what similar fractions should they be changed?

7. What are the denominators of the fractions in example 4? To what like or common denominators did you change both fractions?

8. What are the denominators of the fractions in example 5? To what denominator did you change the fraction $\frac{1}{2}$? $\frac{1}{3}$? Why?

9. After two or more fractions are changed to like or common denominators, that is, after they have been made similar, what is the *second step in adding them?*

10. Add $\frac{1}{2}, \frac{1}{3}, \frac{1}{6}$.

$\frac{1}{2} + \frac{1}{3} + \frac{1}{6} =$
$\frac{3}{6} + \frac{2}{6} + \frac{1}{6} = \frac{6}{6} = 1.$

11. Add $\frac{1}{6}, \frac{1}{4}, \frac{1}{12}$.

$\frac{1}{6} + \frac{1}{4} + \frac{1}{12} =$
$\frac{2}{12} + \frac{3}{12} + \frac{1}{12} = \frac{6}{12} = \frac{1}{2}.$

What is the *third step* in adding fractions?

What is the total length of two remnants of silk, one $\frac{1}{4}$ long, and the other $\frac{7}{8}$ yard long?

Why is the first step not necessary in the following?

14. $\frac{2}{8} + \frac{1}{8}$ **17.** $\frac{1}{6} + \frac{3}{6}$ **20.** $\frac{1}{8} + \frac{3}{8} + \frac{5}{8} + \frac{7}{8}$

15. $\frac{4}{9} + \frac{5}{9}$ **18.** $\frac{3}{7} + \frac{4}{7}$ **21.** $\frac{1}{10} + \frac{3}{10} + \frac{5}{10} + \frac{9}{10}$

16. $\frac{3}{4} + \frac{1}{4}$ **19.** $\frac{5}{6} + \frac{1}{6}$ **22.** $\frac{3}{16} + \frac{5}{16} + \frac{7}{16} + \frac{9}{16}$

Written Work

1. Add $\frac{3}{4}$ and $\frac{5}{9}$.

l. c. d., **36**

$$\frac{3}{4} \times \frac{9}{9} = \frac{27}{36}$$

$$\frac{5}{9} \times \frac{4}{4} = \frac{20}{36}$$

$$\frac{3}{4} + \frac{5}{9} = \frac{47}{36}, \text{ or } 1\frac{11}{36}$$

The l. c. d. of $\frac{3}{4}$ and $\frac{5}{9}$ is 36; $\frac{3}{4} = \frac{27}{36}$ and $\frac{5}{9} = \frac{20}{36}$; $\frac{27}{36} + \frac{20}{36} = \frac{47}{36}$, or $1\frac{11}{36}$.

Observe the three steps in adding fractions:

1. If necessary, make the fractions similar, that is, change them to a common denominator.

2. Write the sum of the numerators over the common denominator.

3. Change the sum to its simplest form.

Add:

2. $\frac{3}{4}, \frac{7}{9}$ **14.** $\frac{2}{15}, \frac{4}{5}, \frac{1}{15}$ **26.** $\frac{2}{3}, \frac{7}{8}, \frac{3}{4}$

3. $\frac{7}{9}, \frac{3}{8}$ **15.** $\frac{9}{10}, \frac{7}{8}, \frac{3}{10}$ **27.** $\frac{4}{5}, \frac{6}{7}, \frac{3}{5}$

4. $\frac{6}{7}, \frac{4}{5}$ **16.** $\frac{2}{3}, \frac{3}{4}, \frac{1}{2}$ **28.** $\frac{2}{7}, \frac{1}{3}, \frac{3}{4}$

5. $\frac{4}{9}, \frac{5}{8}$ **17.** $\frac{2}{3}, \frac{6}{7}, \frac{5}{6}$ **29.** $\frac{4}{9}, \frac{1}{2}, \frac{3}{5}$

6. $\frac{3}{10}, \frac{2}{3}$ **18.** $\frac{6}{7}, \frac{1}{3}, \frac{2}{9}$ **30.** $\frac{7}{8}, \frac{7}{18}, \frac{3}{9}$

7. $\frac{5}{6}, \frac{7}{9}$ **19.** $\frac{3}{4}, \frac{4}{5}, \frac{1}{2}$ **31.** $\frac{11}{12}, \frac{4}{5}, \frac{9}{10}$

8. $\frac{3}{4}, \frac{7}{8}$ **20.** $\frac{1}{2}, \frac{2}{3}, \frac{3}{5}$ **32.** $\frac{1}{10}, \frac{3}{20}, \frac{4}{5}$

9. $\frac{4}{5}, \frac{3}{10}$ **21.** $\frac{3}{4}, \frac{4}{5}, \frac{5}{6}$ **33.** $\frac{1}{2}, \frac{3}{16}, \frac{7}{8}$

10. $\frac{5}{6}, \frac{4}{5}$ **22.** $\frac{5}{6}, \frac{7}{8}, \frac{3}{10}$ **34.** $\frac{4}{9}, \frac{1}{7}, \frac{1}{8}$

11. $\frac{7}{8}, \frac{5}{16}$ **23.** $\frac{3}{8}, \frac{4}{5}, \frac{1}{2}$ **35.** $\frac{5}{6}, \frac{5}{16}, \frac{1}{2}$

12. $\frac{5}{12}, \frac{5}{16}$ **24.** $\frac{3}{5}, \frac{3}{4}, \frac{1}{2}$ **36.** $\frac{7}{10}, \frac{3}{20}, \frac{5}{8}$

13. $\frac{3}{20}, \frac{4}{5}$ **25.** $\frac{7}{8}, \frac{7}{16}, \frac{3}{4}$ **37.** $\frac{3}{20}, \frac{3}{4}, \frac{3}{10}$

How to add mixed numbers.

Written Work

1. Add $8\frac{2}{3}$ and $12\frac{3}{5}$.

l. c. d., **15**

$8\frac{2}{3} = 8\frac{10}{15}$

$12\frac{3}{5} = 12\frac{9}{15}$

$8\frac{2}{3} + 12\frac{3}{5} = 20\frac{19}{15}$, or $21\frac{4}{15}$.

The l. c. d. of $\frac{2}{3}$ and $\frac{3}{5}$ is 15.
$\frac{2}{3} = \frac{10}{15}$; $\frac{3}{5} = \frac{9}{15}$. The sum of $\frac{10}{15}$ and $\frac{9}{15}$ is
$\frac{19}{15}$, which equals $1\frac{4}{15}$.
The 1 is added to the sum of 12 and 8,
making 21, which with $\frac{4}{15}$ makes $21\frac{4}{15}$.

Add:

2. $7\frac{2}{3}$
    $8\frac{1}{4}$

3. $150\frac{2}{4}$
    $68\frac{5}{8}$

4. $80\frac{5}{6}$
    $18\frac{2}{3}$

5. $32\frac{1}{2}$
    $60\frac{5}{12}$

6. $175\frac{1}{2}$
    $16\frac{1}{3}$

7. $350\frac{7}{12}$
    $267\frac{3}{4}$

8. $120\frac{3}{4}$
    $261\frac{3}{10}$

9. $135\frac{1}{6}$
    $122\frac{4}{15}$

10. $80\frac{1}{4}$
    $12\frac{5}{24}$

Add:

11. $1\frac{5}{6} + \frac{3}{8} + 2\frac{7}{8}$

12. $10\frac{8}{9} + 12\frac{2}{3} + 5\frac{7}{12}$

13. $2\frac{5}{12} + 5\frac{3}{4} + 9\frac{4}{15}$

14. $1\frac{3}{4} + 7\frac{1}{4} + 8\frac{7}{8}$

15. $9\frac{3}{5} + 16\frac{7}{10} + 5\frac{11}{15}$

16. $4\frac{7}{8} + \frac{2}{3} + 1\frac{13}{16}$

17. $3\frac{1}{2} + 4\frac{3}{4} + 1\frac{7}{12}$

18. $4\frac{2}{3} + 5\frac{7}{10} + 9\frac{5}{18}$

19. $12\frac{2}{3} + \frac{3}{5} + \frac{7}{8} + 3\frac{9}{10}$

20. $2\frac{2}{9} + 1\frac{1}{6} + 3\frac{1}{4}$

21. A man walked $3\frac{1}{2}$ miles one hour, $3\frac{1}{4}$ miles the second hour, and $2\frac{1}{4}$ miles the third hour. How far did he walk?

22. A farmer sold corn for $\$14\frac{2}{3}$, wheat for $\$37\frac{1}{2}$, and rye for $\$15\frac{1}{10}$. How much did he receive for all?

23. Father spent $\$25\frac{1}{2}$ last month for food, $\$16\frac{4}{5}$ for rent, and $\$13\frac{7}{10}$ for clothing. How much did he spend for these three items?

24. Mary sold $2\frac{1}{2}$ yards of lace to one customer, $3\frac{3}{4}$ yards to another, and $5\frac{7}{8}$ yards to a third. What amount did she sell in all?

25. Find the perimeter or distance around a sheet of paper $9\frac{1}{4}$ in. by $5\frac{1}{8}$ in.

26. Helen canned $189\frac{1}{2}$ qt. of fruit, $253\frac{3}{4}$ qt. of vegetables, 15 qt. of soup, $21\frac{1}{2}$ qt. of meat, and $5\frac{3}{4}$ qt. of jellies. What was the total number of quarts she canned?

27. John deposited $\$6\frac{1}{5}$ in a school savings bank, James $\$7\frac{7}{10}$, Henry $\$9\frac{3}{4}$, and Joseph $\$11\frac{1}{2}$. How much did they all deposit?

28. A man bought flour for $\$3\frac{2}{5}$, apples for $\$3\frac{7}{10}$, and sugar for $\$15\frac{3}{4}$. What was the amount of his bill?

29. Four boys got on a scale together. They weighed $90\frac{1}{2}$ pounds, $95\frac{1}{4}$ pounds, $98\frac{5}{8}$ pounds, and $101\frac{9}{16}$ pounds. What was their total weight?

30. A playground was $75\frac{3}{4}$ yards long and $50\frac{7}{8}$ yards wide. Find the distance around the playground.

31. The widths of 4 lots were as follows: $30\frac{1}{2}$ feet, $42\frac{3}{10}$ feet, $38\frac{11}{20}$ feet, and $48\frac{7}{12}$ feet. Find the entire width of the lots.

32. Five floors of an office building were each 12 feet high, two floors were each $13\frac{3}{4}$ feet high, and one floor was $18\frac{5}{8}$ feet high. What was the total height of the eight floors?

33. A vessel sailed $402\frac{7}{8}$ miles the first day, $370\frac{9}{10}$ miles the second day, $325\frac{3}{4}$ miles the third day, and was then $309\frac{1}{2}$ miles from New York. Find how far the ship had sailed when it reached New York.

34. George planted 4 rows of potatoes. The first row produced $5\frac{7}{8}$ bushels; the second, $5\frac{1}{2}$ bushels; the third, $5\frac{1}{4}$ bushels; and the fourth, $4\frac{7}{8}$ bushels. Find the total amount raised in the 4 rows.

35. A man spent $\frac{3}{10}$ of his salary for food, $\frac{1}{5}$ for rent, and $\frac{3}{20}$ for clothing. What fractional part of his salary did he spend for these purposes?

36. A newsboy earned $\$\frac{2}{3}$ one day, $\$\frac{3}{10}$ another day, and $\$\frac{1}{2}$ a third day. How much did he earn in the 3 days?

37. A stick was broken into two pieces — one $3\frac{3}{4}$ ft. long and the other $1\frac{3}{4}$ ft. long. How long was the whole stick?

38. If a man earned $\$3\frac{2}{3}$ a day, and a boy $\$\frac{3}{4}$ a day, how much did the man and the boy earn together in a day?

39. Find the total cost of the following purchases: flour, $\$1\frac{2}{5}$; sugar, $\$\frac{1}{4}$; dried beef, $\$\frac{3}{10}$; and corned beef, $\$\frac{1}{2}$.

40. Anna had some lace for dolls' dresses in four pieces, measuring $1\frac{3}{4}$ yards, $1\frac{3}{4}$ yards, $2\frac{1}{4}$ yards, and $2\frac{1}{2}$ yards. How much lace did she have in all?

41. The rainfall in April was $4\frac{1}{10}$ inches, in May $3\frac{3}{4}$ inches, and in June $4\frac{1}{5}$ inches. What was the total rainfall for the 3 months?

42. A farmer drove first $12\frac{3}{4}$ miles, then $6\frac{7}{8}$ miles, and then $9\frac{1}{2}$ miles. How far did he drive?

43. The feed for a horse cost $\$8\frac{2}{5}$ a month and for a cow, $\$6\frac{1}{4}$ a month. If a man had 2 horses and 2 cows, how much did it cost to feed them a month?

44. Three lengths of ribbon were cut from a piece — the first, $1\frac{3}{4}$ yd. long; the second, $2\frac{1}{5}$ yd. long; and the third, $3\frac{1}{16}$ yd. long. How much ribbon in all was cut from the piece?

Oral Work

$$\frac{1}{2} \quad = \quad \frac{2}{4} \quad = \quad \frac{8}{16}$$

1. 1 sq. in. $- \frac{1}{2}$ sq. in. = —— sq. in.

2. $\frac{1}{2}$ sq. in. $- \frac{1}{4}$ sq. in. = —— sq. in.

3. 1 sq. in. $- \frac{1}{4}$ sq. in. = —— sq. in.

4. $\frac{1}{2}$ sq. in. $- \frac{4}{16}$ sq. in. = —— sq. in.

5. $\frac{1}{2}$ sq. in. $- \frac{1}{16}$ sq. in. = —— sq. in.

6. $\frac{3}{4} - \frac{1}{4} = \frac{?}{4}$; $\frac{5}{8} - \frac{1}{8} = \frac{?}{8}$; $\frac{9}{10} - \frac{3}{10} = \frac{?}{10}$.

7. Give answers to the following: $\frac{11}{12} - \frac{5}{12} = ?$ $\frac{11}{18} - \frac{5}{18} = ?$ $\frac{6}{11} - \frac{4}{11} = ?$ $\frac{18}{20} - \frac{3}{20} = ?$ $\frac{24}{25} - \frac{3}{25} = ?$

8. What do you notice about the denominators of the fractions you have subtracted in example 7?

9. When the denominators are alike, what do you subtract?

10. Could you subtract $\frac{1}{3}$ from $\frac{1}{2}$ without change? How may these fractions be made similar?

11. When the denominators are *unlike*, what is the *first step?* What is the *second step?* What is the *third step?*

Subtract:

12. $\frac{1}{2} - \frac{1}{4}$ $\frac{1}{2} - \frac{1}{3}$ $\frac{1}{2} - \frac{1}{6}$ $\frac{1}{2} - \frac{1}{8}$ $\frac{1}{2} - \frac{1}{3}$

13. $\frac{1}{3} - \frac{1}{6}$ $\frac{1}{3} - \frac{1}{9}$ $\frac{1}{3} - \frac{1}{12}$ $\frac{1}{3} - \frac{1}{15}$ $\frac{1}{3} - \frac{1}{24}$

14. $\frac{1}{4} - \frac{1}{8}$ $\frac{1}{4} - \frac{1}{5}$ $\frac{1}{4} - \frac{1}{6}$ $\frac{1}{4} - \frac{1}{16}$ $\frac{1}{4} - \frac{1}{12}$

How to subtract fractions or mixed numbers that are not similar.

Written Work

1. From $\frac{3}{4}$ take $\frac{3}{5}$.

l. c. d., 20

$$\frac{3 \times 5}{4 \times 5} = \frac{15}{20}$$

$$\frac{3 \times 4}{5 \times 4} = \frac{12}{20}$$

$$\frac{3}{4} - \frac{3}{5} = \frac{3}{20}$$

The l. c. d. is 20. $\frac{3}{4} = \frac{15}{20}$; $\frac{3}{5} = \frac{12}{20}$; $\frac{15}{20} - \frac{12}{20}$ $= \frac{3}{20}$.

Observe the three steps in subtracting fractions:

1. If necessary, make the fractions similar; that is, reduce them to a common denominator.

2. Subtract the smaller numerator from the greater and write the result over the common denominator.

3. Change the result to its simplest form.

Find the differences:

2. $\frac{2}{3} - \frac{1}{4}$	**9.** $\frac{4}{5} - \frac{3}{10}$	**16.** $\frac{2}{3} - \frac{5}{12}$
3. $\frac{3}{4} - \frac{3}{8}$	**10.** $\frac{7}{9} - \frac{2}{3}$	**17.** $\frac{3}{4} - \frac{3}{16}$
4. $\frac{5}{6} - \frac{2}{3}$	**11.** $\frac{3}{8} - \frac{5}{16}$	**18.** $\frac{5}{6} - \frac{2}{5}$
5. $\frac{7}{10} - \frac{2}{5}$	**12.** $\frac{2}{5} - \frac{4}{15}$	**19.** $\frac{5}{6} - \frac{3}{4}$
6. $\frac{5}{6} - \frac{5}{12}$	**13.** $\frac{3}{4} - \frac{7}{12}$	**20.** $\frac{7}{8} - \frac{7}{16}$
7. $\frac{3}{8} - \frac{3}{16}$	**14.** $\frac{7}{8} - \frac{3}{4}$	**21.** $\frac{11}{12} - \frac{2}{3}$
8. $\frac{5}{6} - \frac{7}{12}$	**15.** $\frac{7}{8} - \frac{5}{16}$	**22.** $\frac{9}{16} - \frac{3}{8}$

23. From a piece of cloth containing $\frac{7}{8}$ of a yard, $\frac{3}{4}$ of a yard was sold. What part of a yard remained?

24. John lived $\frac{3}{8}$ mi. from the playground and Peter $\frac{5}{16}$ mi. How much farther did John walk from home to the playground than Peter walked?

25. Mary made a kitchen towel from a piece of linen $\frac{7}{8}$ yd. long. She used $\frac{1}{16}$ yd. for the hems. How long was the towel when hemmed?

26. From 7 take $\frac{2}{3}$.

$$7 = 6\frac{3}{3}$$
$$\frac{2}{3} = \frac{2}{3}$$
$$\overline{7 - \frac{2}{3} = 6\frac{1}{3}}$$

Change 7 to 6 and $\frac{3}{3}$.
$\frac{3}{3} - \frac{2}{3} = \frac{1}{3}$, which added to $6 = 6\frac{1}{3}$.

Find the differences:

27. $3 - \frac{1}{2}$	**34.** $9 - \frac{5}{6}$	**41.** $25 - \frac{7}{8}$
28. $12 - \frac{2}{3}$	**35.** $3 - \frac{4}{7}$	**42.** $10 - \frac{4}{5}$
29. $22 - \frac{11}{12}$	**36.** $10 - \frac{9}{10}$	**43.** $11 - \frac{3}{4}$
30. $7 - \frac{1}{8}$	**37.** $18 - \frac{14}{15}$	**44.** $40 - \frac{3}{8}$
31. $33 - \frac{8}{9}$	**38.** $28 - \frac{11}{14}$	**45.** $7 - \frac{8}{11}$
32. $44 - \frac{2}{25}$	**39.** $55 - \frac{13}{18}$	**46.** $51 - \frac{7}{10}$
33. $18 - \frac{7}{8}$	**40.** $4 - \frac{19}{20}$	**47.** $48 - \frac{7}{8}$

48. If I had $2 and spent $\frac{4}{5}$, how much had I left?

49. A can contained 8 gallons of oil. After $\frac{7}{8}$ of a gallon was used, how much remained?

50. A grocer who had bought 10 bushels of potatoes, sold $\frac{3}{4}$ of a bushel. How many bushels remained?

51. From $12\frac{3}{4}$ take $10\frac{1}{2}$.

l. c. d., 4

$$12\frac{3}{4} = 12\frac{3}{4}$$
$$10\frac{1}{2} = 10\frac{2}{4}$$
$$\overline{12\frac{3}{4} - 10\frac{1}{2} = 2\frac{1}{4}}$$

Change $\frac{1}{2}$ to fourths. $\frac{1}{2} = \frac{2}{4}$.
$\frac{3}{4} - \frac{2}{4} = \frac{1}{4}$; $12 - 10 = 2$.
$2 + \frac{1}{4} = 2\frac{1}{4}$.

Find the differences:

52. $4\frac{3}{4} - 3\frac{1}{2}$	**59.** $79\frac{13}{16} - 26\frac{5}{8}$	**66.** $100\frac{1}{3} - 52\frac{1}{7}$
53. $7\frac{2}{3} - 4\frac{1}{2}$	**60.** $97\frac{17}{25} - 35\frac{3}{5}$	**67.** $78\frac{2}{3} - 35\frac{2}{5}$
54. $10\frac{5}{6} - 3\frac{1}{3}$	**61.** $121\frac{3}{4} - 66\frac{2}{5}$	**68.** $50\frac{4}{5} - 40\frac{1}{8}$
55. $10\frac{7}{8} - 2\frac{3}{4}$	**62.** $80\frac{5}{8} - 14\frac{1}{2}$	**69.** $124\frac{5}{11} - 112\frac{1}{4}$
56. $12\frac{7}{9} - 5\frac{3}{4}$	**63.** $98\frac{3}{8} - 32\frac{1}{3}$	**70.** $240\frac{14}{15} - 200\frac{3}{5}$
57. $24\frac{7}{10} - 11\frac{3}{5}$	**64.** $45\frac{11}{36} - 30\frac{1}{4}$	**71.** $15\frac{7}{9} - 8\frac{1}{2}$
58. $31\frac{11}{12} - 18\frac{5}{6}$	**65.** $25\frac{4}{9} - 12\frac{1}{4}$	**72.** $117\frac{3}{4} - 15\frac{5}{8}$

Find the value of:

73. $7\frac{1}{4} - 2\frac{5}{8}$

l. c. d., 8

$$7\frac{1}{4} = 6\frac{5}{4} = 6\frac{10}{8}$$

$$2\frac{5}{8} = 2\frac{5}{8}$$

$$7\frac{1}{4} - 2\frac{5}{8} = 4\frac{5}{8}$$

Since $\frac{5}{8}$ is greater than $\frac{1}{4}$, change $7\frac{1}{4}$ to $6\frac{5}{4}$. The l. c. d. is 8. $\frac{5}{4} = \frac{10}{8}$. Subtract $2\frac{5}{8}$ from $6\frac{10}{8}$. The remainder is $4\frac{5}{8}$.

74. $3\frac{1}{3} - 1\frac{1}{2}$	**78.** $20\frac{1}{12} - 13\frac{5}{6}$	**82.** $44\frac{3}{4} - 12\frac{1}{4}$
75. $5 - 2\frac{2}{3}$	**79.** $50\frac{1}{6} - 30\frac{3}{5}$	**83.** $36\frac{1}{4} - 11\frac{4}{15}$
76. $5\frac{1}{4} - 2\frac{3}{5}$	**80.** $6\frac{2}{5} - 2\frac{3}{7}$	**84.** $81\frac{1}{2} - 14\frac{6}{7}$
77. $10\frac{3}{8} - 5\frac{3}{4}$	**81.** $11\frac{3}{5} - 5\frac{3}{8}$	**85.** $21\frac{3}{5} - 12\frac{7}{8}$

86. One motorman's trip took $4\frac{2}{5}$ hours, and another's $2\frac{2}{3}$ hours. How much longer was the first trip than the second?

87. A man bought two suits of clothes, one costing $\$35\frac{1}{2}$ and the other $\$28\frac{3}{4}$. How much more did the first suit cost than the second?

88. James lived $1\frac{9}{20}$ miles from the schoolhouse, and Samuel, $1\frac{4}{5}$ miles. How much farther did Samuel have to walk to school than James?

89. A man earned $\$3\frac{2}{5}$ a day, and a boy, $\$\frac{3}{4}$ a day. How much more did the man earn in a day than the boy?

90. A boy was $4\frac{5}{12}$ feet tall. His sister was $3\frac{2}{3}$ feet tall. How much taller was the boy than his sister?

91. The top of a door was $12\frac{1}{2}$ feet above the ground, and the bottom of it was $4\frac{3}{4}$ feet above the ground. How high was the door?

92. From a barrel containing $51\frac{1}{2}$ gallons of oil, $17\frac{1}{2}$ gallons were sold in one day, and $25\frac{1}{2}$ gallons another day. How many gallons remained unsold?

93. A station agent who was paid $\$80$ a month spent in one month $\$12\frac{2}{5}$ for groceries, $\$7\frac{7}{10}$ for meat, and $\$15\frac{1}{4}$ for other expenses. How much did he save?

Review

Find the value of:

1. $\frac{2}{3} + \frac{3}{4} - \frac{5}{6}$
2. $3\frac{1}{2} + 2\frac{1}{4} - 1\frac{5}{8}$
3. $5\frac{1}{3} + 4\frac{5}{6} - 4\frac{5}{12}$
4. $1\frac{5}{8} + 2\frac{1}{12} - 1\frac{5}{8}$
5. $9\frac{3}{5} - 4\frac{2}{5} + 3\frac{7}{10}$
6. $12\frac{3}{4} - 5\frac{1}{2} + 2\frac{2}{9}$
7. $\frac{3}{4} - \frac{1}{2} + \frac{7}{8} + \frac{5}{16}$
8. $20 + \frac{1}{16} + \frac{1}{12} - 2\frac{1}{4}$
9. $\frac{1}{3} + \frac{1}{4} + \frac{5}{6} - \frac{7}{12}$
10. $17\frac{11}{24} - 10\frac{3}{8} + 5\frac{1}{3} + 2\frac{5}{8}$

11. $15 - 2\frac{2}{3} + 4\frac{1}{4}$
12. $40\frac{1}{4} + 60\frac{1}{8} + 30\frac{11}{16}$
13. $19\frac{27}{32} - 11\frac{5}{8} + 1\frac{5}{16}$
14. $7\frac{7}{9} + 4\frac{1}{2} + 11\frac{5}{12}$
15. $3\frac{5}{12} + 9\frac{5}{6} - 7\frac{1}{6}$
16. $21\frac{7}{12} + 7\frac{1}{4} - 20\frac{1}{4}$
17. $8\frac{3}{4} + 22\frac{2}{5} + 43\frac{3}{8}$
18. $225\frac{3}{8} + 132\frac{5}{12} + 80\frac{17}{20}$
19. $12\frac{2}{3} + 19\frac{7}{8} - 27\frac{5}{6}$
20. $19\frac{1}{5} + 11\frac{3}{8} + 14\frac{1}{3}$

21. Arthur bought a hat and gave in payment $10. If he received in change $7¾, how much did the hat cost?

22. The treasurer of a literary society received $492½. He spent for light and heat $50¾, for new books $77¼, for a lecturer's expenses $26½, and for music for an entertainment $80. How much remained in his hands?

23. A teacher's salary was $95 a month. One month he spent $30 for board, $9½ for a room, $9⅔ for clothes, and $10 1/10 for other expenses. How much did he save?

24. A dealer bought 61¾ bushels of apples from one man, 127½ bushels from another, and 89¾ bushels from another. How much did they cost at $1.50 a bushel?

25. A student spent ¼ of the day in study, ⅙ in recitations, 1/12 at his meals, and ⅛ in recreation and exercise. What part of the day had he left for sleep?

26. A boy walked around a field 60½ rods long and 40 rods wide. How far did he walk?

27. John raised $45\frac{1}{2}$ bushels of corn and Hugh raised $37\frac{4}{5}$ bushels. How much more did John raise than Hugh ?

28. Helen timed herself in knitting a sock. It took her $1\frac{1}{8}$ hours to purl the top, $2\frac{1}{8}$ hours for the leg, $1\frac{1}{4}$ hours for the heel, $2\frac{3}{8}$ hours for the foot and toe. How long did it take her to finish the sock ?

29. A clerk earned $\$80$ a month and spent for board $\$33\frac{1}{2}$, for clothes $\$15\frac{3}{4}$, and for other expenses $\$16\frac{1}{8}$. How much of his month's salary did he save ?

30. From a piece of ribbon containing 10 yards were sold $\frac{1}{2}$ of a yard, $1\frac{1}{4}$ yards, $\frac{3}{4}$ of a yard, $\frac{5}{8}$ of a yard, $2\frac{3}{4}$ yards, and 3 yards. How many yards remained unsold ?

31. A mail carrier worked 8 hours a day. In making three deliveries he worked $1\frac{1}{8}$ hours, $2\frac{1}{8}$ hours, and $2\frac{3}{4}$ hours. How much time had he for a fourth delivery ?

32. Paul raised $24\frac{1}{2}$ tons of sugar beets and Frank raised $20\frac{4}{5}$ tons. How much more did Paul raise than Frank ?

33. Alfred caught 3 fish. The first weighed $\frac{1}{2}$ of a pound, the second $\frac{7}{8}$ of a pound, and the third $1\frac{1}{4}$ pounds. How much did the three fish weigh together ?

34. A real estate agent bought $16\frac{1}{2}$ acres of land. He sold $2\frac{1}{4}$ acres to one man and $5\frac{7}{8}$ acres to another man. How many acres had he remaining ?

35. The sum of two fractions is $\frac{7}{8}$ and one of the fractions is $\frac{3}{8}$. What is the other fraction ?

36. A dairyman sold milk as follows: Monday, $65\frac{3}{8}$ gallons ; Tuesday, $60\frac{1}{2}$ gallons ; Wednesday, $71\frac{3}{4}$ gallons ; Thursday, 69 gallons ; Friday, $67\frac{7}{8}$ gallons ; and Saturday, $90\frac{1}{4}$ gallons. What were his total sales for the week ?

37. A salesman traveled in 4 days as follows : Monday, $122\frac{1}{2}$ miles ; Tuesday, $187\frac{3}{4}$ miles ; Wednesday, $93\frac{1}{2}$ miles ; and Thursday, $207\frac{3}{16}$ miles. How many miles did he travel in all ?

38. If a boat will safely carry 800 pounds, how many pounds of provisions can be carried when three men, whose weights are $165\frac{1}{2}$ pounds, $182\frac{3}{4}$ pounds, and 208 pounds, are in the boat?

39. In 3 days in June the sun shone in New York $14\frac{3}{4}$ hours, $14\frac{3}{20}$ hours, and $14\frac{19}{20}$ hours. How many hours of sunshine were there in these 3 days? How many hours without sunshine were there?

40. Raymond walked $1\frac{7}{8}$ miles to school, and George walked $\frac{3}{4}$ of a mile. How far did they both walk, and how much farther did Raymond walk than George?

41. A playground was $16\frac{1}{4}$ yards wide and $25\frac{2}{3}$ yards long. Find the distance around it. How much greater was the playground in length than in width?

42. Measure the distance around your school ground in feet and fractions of a foot; then in yards and fractions of a yard; then secure a tape line and measure it in rods and fractions of a rod. Find its *perimeter* in each of these three units of measure.

43. With a yardstick let each pupil measure in feet and fractions of a foot the length and the width of the different rooms in each one's house, first finding the perimeter of each room, and then the difference between the length and the width of each room.

44. The rainfall in three different months was as follows: $3\frac{7}{10}$ inches, $4\frac{2}{8}$ inches, and $2\frac{3}{10}$ inches. Find the rainfall for the three months, and the difference between the greatest rainfall and the rainfall for each of the other months.

45. A baby gained 2 ounces the first week, 3 ounces the second week, 4 ounces the third week, and 8 ounces the fourth week. Express each week's gain as a part of a pound and find how many pounds the baby gained in four weeks.

46. Make up two problems involving addition and sub-
traction of fractions, and two involving addition and subtrac-
tion of mixed numbers.

47. A western farmer sold three loads of alfalfa in one
summer. The first weighed $2\frac{3}{4}$ tons; the second, $2\frac{7}{8}$ tons;
and the third, $1\frac{3}{4}$ tons. Find the entire number of tons
sold.

48. Hugh's father cut ice on his mill pond three times
during the winter. The first cutting was $6\frac{5}{8}$ inches, the
second cutting was $8\frac{3}{4}$ inches, and the third cutting was $5\frac{9}{16}$
inches. Find the entire thickness of the ice for the three
cuttings.

49. In problem 48 find the difference between the great-
est thickness and each of the other two thicknesses.

50. Arthur is 4 feet 8 inches tall, and Ada is 3 feet 9
inches tall. Express their heights in feet as mixed num-
bers. How much taller is Arthur than Ada?

51. The weather department reported $3\frac{1}{8}$ hours sunshine
on Monday, $2\frac{2}{3}$ hours sunshine on Tuesday, and $5\frac{1}{4}$ hours
sunshine on Wednesday. Find the total time of sunshine
for the three days.

52. Robert ran 100 yards in $9\frac{3}{10}$ seconds and George ran
the same distance in $11\frac{3}{4}$ seconds. By how much did Robert
beat George's time?

53. Edward weighs 70 pounds 8 ounces and James weighs
98 pounds 4 ounces. Express their weights as mixed num-
bers and find the sum and the difference of their weights.

54. Jean grew $\frac{3}{4}$ of an inch in three months, Paul grew $\frac{5}{8}$
of an inch, and Susan grew $\frac{5}{16}$ of an inch. Express the
difference between Jean's growth and each of the other
two.

55. James worked $6\frac{3}{4}$ hours after school in one week, Henry worked $4\frac{1}{8}$ hours, and Frank worked $2\frac{1}{2}$ hours. Find the number of hours the three boys were employed during the week.

56. Mary's hair ribbon contained $\frac{3}{4}$ of a yard; Ruth's hair ribbon contained $\frac{7}{8}$ of a yard; and Martha's sash contained $2\frac{1}{2}$ yards. How many yards of ribbon were there in all three pieces?   ·

57. John is $7\frac{3}{4}$ years old, and his father is 30 years and 6 months old. How much older is John's father than John?

58. If a rug is $6\frac{2}{3}$ feet long and $4\frac{5}{12}$ feet wide, what is the difference between its length and its width?

59. Mary bought three remnants of ribbon. The first was $3\frac{3}{4}$ yards; the second, $\frac{7}{8}$ of a yard; and the third, $2\frac{1}{16}$ yards. How much ribbon did Mary buy?

60. Three boys rowed $8\frac{1}{4}$ miles from their camp to the village. Martin rowed $3\frac{5}{16}$ miles and Frank rowed $1\frac{5}{8}$ miles. How far did Howard row?

First add each number in a to the numbers on the same line in b, c, d, e, f, g. Thus, in 61, add $2\frac{4}{5}$, first to $3\frac{5}{8}$, then to $4\frac{3}{4}$, then to $8\frac{2}{3}$, etc. In 62 add $4\frac{3}{8}$, first to $6\frac{2}{3}$, then to $5\frac{2}{7}$, etc. Then subtract each number in column a from the numbers on the same line in b, c, d, e, f, g. Thus, in 61, subtract $2\frac{4}{5}$, first from $3\frac{5}{8}$, then from $4\frac{3}{4}$, then from $8\frac{2}{3}$, etc. In 62 subtract $4\frac{3}{8}$, first from $6\frac{2}{3}$, then from $5\frac{2}{7}$, etc.

	a	b	c	d	e	f	g
61.	$2\frac{4}{5}$	$3\frac{5}{8}$	$4\frac{3}{4}$	$8\frac{2}{3}$	$5\frac{1}{2}$	$7\frac{3}{4}$	$9\frac{2}{3}$
62.	$4\frac{3}{8}$	$6\frac{2}{3}$	$5\frac{2}{7}$	$5\frac{1}{2}$	$8\frac{1}{4}$	$9\frac{2}{3}$	$9\frac{1}{4}$
63.	$8\frac{3}{10}$	$11\frac{4}{5}$	$12\frac{7}{10}$	$15\frac{4}{7}$	$22\frac{5}{12}$	$32\frac{5}{16}$	$25\frac{11}{12}$
64.	$9\frac{1}{4}$	$40\frac{5}{8}$	$45\frac{3}{16}$	$48\frac{9}{10}$	$14\frac{3}{10}$	$60\frac{5}{8}$	$65\frac{4}{15}$
65.	$8\frac{1}{10}$	$75\frac{1}{5}$	$80\frac{5}{18}$	$59\frac{3}{16}$	$77\frac{3}{8}$	$68\frac{5}{9}$	$98\frac{4}{11}$

Time yourself in these examples.
Then work them again and try to improve your record.

Oral Work

Add:

	a	b	c	d	e	f	g	h	i	j
1.	$\frac{5}{8}$ $\frac{7}{8}$	$\frac{1}{6}$ $\frac{5}{6}$	$\frac{9}{10}$ $\frac{8}{10}$	$\frac{8}{9}$ $\frac{4}{9}$	$\frac{11}{16}$ $\frac{14}{16}$	$\frac{9}{10}$ $\frac{7}{10}$	$\frac{12}{13}$ $\frac{10}{13}$	$\frac{7}{11}$ $\frac{9}{11}$	$\frac{9}{14}$ $\frac{8}{14}$	$\frac{9}{16}$ $\frac{13}{16}$
2.	$\frac{4}{6}$ $\frac{3}{6}$	$\frac{8}{10}$ $\frac{7}{10}$	$\frac{8}{20}$ $\frac{7}{20}$	$\frac{2}{25}$ $\frac{3}{25}$	$\frac{7}{15}$ $\frac{8}{15}$	$\frac{7}{9}$ $\frac{8}{9}$	$\frac{6}{7}$ $\frac{5}{7}$	$\frac{5}{12}$ $\frac{11}{12}$	$\frac{5}{13}$ $\frac{9}{13}$	$\frac{15}{16}$ $\frac{11}{16}$

Written Work

Add:

1. $3\frac{2}{6}$
   $5\frac{3}{4}$

4. $6\frac{1}{6}$
   $7\frac{2}{3}$

7. $3\frac{2}{9}$
   $5\frac{1}{3}$

10. $3\frac{1}{2}$
    $8\frac{3}{4}$

13. $4\frac{1}{8}$
    $5\frac{3}{7}$

2. $3\frac{4}{6}$
   $2\frac{3}{10}$

5. $7\frac{3}{8}$
   $4\frac{1}{12}$

8. $6\frac{5}{9}$
   $2\frac{5}{12}$

11. $12\frac{1}{3}$
    $15\frac{3}{4}$

14. $7\frac{7}{8}$
    $2\frac{1}{2}$

3. $25\frac{3}{6}$
   $21\frac{3}{10}$

6. $63\frac{7}{12}$
   $50\frac{3}{10}$

9. $61\frac{5}{8}$
   $27\frac{1}{8}$

12. $98\frac{3}{16}$
    $15\frac{11}{24}$

15. $6\frac{7}{8}$
    $3\frac{3}{16}$

Subtract, and test results by adding:

16. $24\frac{3}{4}$
    $14\frac{1}{2}$

18. $40\frac{3}{8}$
    $12\frac{1}{10}$

20. $44\frac{7}{8}$
    $29\frac{3}{4}$

22. $14\frac{11}{12}$
    $9\frac{3}{10}$

24. $27\frac{5}{8}$
    $19\frac{7}{16}$

17. $91\frac{13}{16}$
    $47\frac{1}{3}$

19. $36\frac{5}{9}$
    $18\frac{2}{3}$

21. $15\frac{5}{8}$
    $9\frac{1}{10}$

23. $40\frac{7}{8}$
    $20\frac{3}{16}$

25. $18\frac{7}{12}$
    $11\frac{1}{3}$

How to find the product of a fraction by a whole number.

Oral Work

3 feet = 1 yard
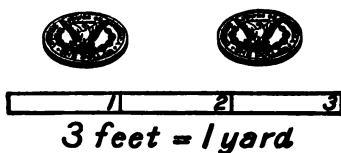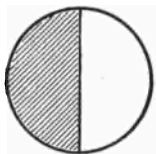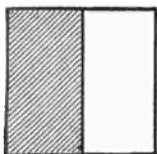
1. What is $\frac{1}{2}$ of 2?

2. Two times $\$\frac{1}{2}$ = —— dollar.

Notice that $\frac{1}{2}$ of $\$2 = 2 \times \$\frac{1}{2}$.

3. Into how many halves is the square divided? Two times $\frac{1}{2}$ the square = —— square.

4. Into how many halves is the circle divided? Two times $\frac{1}{2}$ the circle = —— circle.

5. What is $\frac{1}{3}$ of 3 feet? $\frac{1}{3}$ of 3 = ?

6. How much is 3 times $\frac{1}{3}$ of a yard?

7. $\frac{1}{2}$ of $\$5 = ?$ $5 \times \$\frac{1}{2} = ?$

Notice that $\frac{1}{2}$ of $\$5 = 5 \times \$\frac{1}{2}$.

8. $2 \times \frac{1}{3}$ of a yard = —— yard.

9. $\frac{2}{3}$ of 1 yard = —— yard.

10. $6 \times \frac{1}{3}$ of a yard = —— yards.

11. $\frac{1}{3}$ of 6 yards = —— yards.

12. $6 \times \frac{1}{2}$ of a circle = —— circles.

13. $\frac{1}{2}$ of 6 circles = —— circles.

14. $12 \times \frac{1}{2}$ of a circle = —— circles.

15. $\frac{1}{2}$ of 12 circles = —— circles.

16. $4 \times \frac{1}{2}$ is the same as $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$.

17. $6 \times \frac{1}{2} = \frac{6}{2}$, or 3. Therefore, to multiply $\frac{1}{2}$ by 6, we say 6 times $\frac{1}{2} = \frac{6}{2}$, or 3.

Give the products:

18. $8 \times \frac{1}{2}$	**23.** $9 \times \frac{2}{3}$	**28.** $7 \times \frac{4}{9}$	**33.** $3 \times \frac{7}{11}$
19. $12 \times \frac{1}{4}$	**24.** $8 \times \frac{3}{4}$	**29.** $12 \times \frac{8}{9}$	**34.** $12 \times \frac{4}{7}$
20. $6 \times \frac{2}{3}$	**25.** $9 \times \frac{9}{10}$	**30.** $4 \times \frac{7}{11}$	**35.** $5 \times \frac{7}{8}$
21. $7 \times \frac{3}{7}$	**26.** $6 \times \frac{4}{5}$	**31.** $8 \times \frac{3}{7}$	**36.** $6 \times \frac{4}{5}$
22. $10 \times \frac{3}{5}$	**27.** $8 \times \frac{5}{6}$	**32.** $11 \times \frac{7}{8}$	**37.** $6 \times \frac{8}{9}$

38. When you multiply $\frac{3}{4}$ by 8, which number is the multiplier? Which number is the multiplicand?

You have learned that you may divide a unit into equal parts and then take any number of these parts. Thus, $\frac{3}{4}$ of $8 means that $8 (8 units) is divided into 4 equal parts of $2 each and that 3 of these parts, or $6, are taken.

Notice that $\frac{3}{4}$ of $8 = 8 \times \frac{3}{4}$.

39. If the sign of multiplication is written after a fractional multiplier, it may be read "of." Thus, $\frac{3}{4} \times 12$ may be read "$\frac{3}{4}$ of 12." Read: $\frac{2}{3} \times 9$; $\frac{3}{4} \times 6$; $\frac{7}{8} \times 4$; $\frac{3}{5} \times 10$.

Find the following:

40. $\frac{3}{4}$ of $24	**44.** $\frac{5}{9}$ of 36 minutes	**48.** $\frac{7}{9}$ of 72 cents
41. $\frac{9}{10}$ of 60 horses	**45.** $\frac{11}{12}$ of $144	**49.** $\frac{9}{11}$ of 99
42. $\frac{2}{3}$ of 36 days	**46.** $\frac{6}{13}$ of 78 miles	**50.** $\frac{4}{15}$ of 75
43. $\frac{4}{5}$ of 20 hours	**47.** $\frac{5}{11}$ of 44 rods	**51.** $\frac{3}{7}$ of 84

52. Find $\frac{2}{3}$ of 4.

SOLUTION. $\frac{1}{3}$ of $4 = \frac{4}{3}$, and $\frac{2}{3}$ of $4 = 2 \times \frac{4}{3}$, or $\frac{8}{3}$; $\frac{8}{3} = 2\frac{2}{3}$.

Find the following:

53. $\frac{2}{5}$ of 7	**59.** $\frac{9}{10}$ of 12	**65.** $\frac{2}{7}$ of 20
54. $\frac{3}{4}$ of 9	**60.** $\frac{11}{15}$ of 8	**66.** $\frac{3}{7}$ of 6
55. $\frac{7}{8}$ of 12	**61.** $\frac{7}{11}$ of 8	**67.** $\frac{4}{5}$ of 9
56. $\frac{5}{9}$ of 8	**62.** $\frac{2}{5}$ of 9	**68.** $\frac{3}{8}$ of 11
57. $\frac{6}{7}$ of 10	**63.** $\frac{4}{11}$ of 12	**69.** $\frac{7}{9}$ of 10
58. $\frac{4}{5}$ of 3	**64.** $\frac{7}{8}$ of 7	**70.** $\frac{5}{8}$ of 12

Written Work

1. Find the cost of $\frac{7}{8}$ yard of silk at $2 a yard.

2. The freight on a ton of merchandise was 56 cents. What was the freight charge for $\frac{5}{8}$ of a ton?

3. Find the cost of $\frac{3}{4}$ of a dozen buttons at $1.28 a dozen.

4. A workman earned $4 a day. How much did he earn in $\frac{5}{8}$ of a day?

5. At 42 miles an hour, how far did an automobile travel in $\frac{2}{3}$ of an hour?

6. A merchant owing $1236 gave his check for $\frac{3}{4}$ of the amount. For how much did he write his check?

7. Mr. Rice owned a tract of land containing 2500 acres. He sold $\frac{2}{5}$ of it to Mr. Brown and $\frac{1}{3}$ of the remainder to Mr. Thomas. How much did he sell to each?

8. If a laborer worked $\frac{4}{5}$ of the days in a common year, how many days did he work?

9. A student's expenses at college were $720 a year. If board and tuition cost $\frac{2}{3}$ of that amount, how much did the other expenses amount to?

10. A contractor agreed to erect a building for $24,570. Labor cost $\frac{1}{3}$ of the amount, material $\frac{2}{3}$ of the remainder. Find his profit.

11. $\frac{5}{8}$ of the entire enrollment of 14,720 in school were girls. Find the number of girls and the number of boys.

12. A man whose income was $960 spent $\frac{3}{8}$ of this amount for a year's rent. Find the monthly rent bill.

13. An automobile cost $3456 and the expenses and repairs for one year were $\frac{3}{16}$ of the cost. Find the expenses.

14. A farmer bought a farm of 160 acres at $25 an acre. He erected a house costing $\frac{2}{5}$ as much as the land, and a barn costing $\frac{1}{2}$ as much as the house. Find the total cost of the property.

How to multiply a mixed number by a whole number or a whole number by a mixed number.

Oral Work

1. Find the cost of $2\frac{3}{4}$ pounds of butter at 48 cents a pound.

2. I bought $4\frac{7}{8}$ yards of ribbon at 40 cents a yard. How much did it cost?

3. A boy scout walked 3 miles in an hour. How far did he walk at the same rate in $2\frac{2}{3}$ hours?

4. Kate sold a customer $2\frac{5}{8}$ yd. ribbon @ 16 cents and $1\frac{1}{4}$ yd. lace @ 40 cents. What was the total of the sales slip?

5. How much did $5\frac{2}{3}$ pounds of fish cost at 24 cents a pound?

6. A man bought $7\frac{1}{2}$ gallons of oil at 12 cents a gallon. How much did he pay for it?

7. Natural gas costs 25 cents a thousand feet. Find the cost of $10\frac{2}{5}$ thousand feet.

8. If a lot cost \$200 and a house $8\frac{1}{5}$ times as much, how much did the house cost?

9. Ida worked on a farm $20\frac{3}{4}$ days in a month for \$2 a day. How much did she earn?

10. How many inches equal $9\frac{2}{4}$ feet?

11. At 80 cents a bushel, find the cost of $2\frac{1}{2}$ bushels of oats.

12. Walter bought $1\frac{3}{4}$ dozen collars at \$2 a dozen. How much did they cost him?

13. At 12 cents a pound find the cost of $15\frac{3}{4}$ pounds of raisins.

14. How much did $5\frac{1}{8}$ yards of cloth cost at $2 a yard?

15. A workman earned 75 cents an hour. How much did he receive in $3\frac{2}{3}$ hours?

16. How far did an automobile travel in $2\frac{1}{2}$ hours at 18 miles an hour?

17. The freight on a ton of merchandise was 32 cents. How much was it for the same distance on $5\frac{5}{8}$ tons?

18. A gallon of water weighs 8 pounds. How much do $10\frac{3}{4}$ gallons weigh?

19. Find the cost of 6 eggs at $4\frac{1}{2}$ cents apiece.

20. Find the cost of 4 quarts of oil at $4\frac{1}{2}$ cents a quart.

21. Find the cost of 8 pounds of rice at $8\frac{1}{2}$ cents a pound.

22. Find the cost of 12 pounds of sugar at $9\frac{1}{2}$ cents a pound.

23. Find the cost of 6 boxes of berries at $8\frac{1}{2}$ cents a box.

24. A boy earned $1\frac{3}{4} a day. How much did he earn in 6 days?

25. When apples sold for $1\frac{1}{4} a bushel, find the cost of 8 bushels.

26. Mary paid $1\frac{3}{4} for music lessons and took two lessons a week. How much did her music lessons cost her in 4 weeks?

27. Find the cost of 24 yards of silk at $1\frac{3}{8} a yard.

28. We paid $15\frac{1}{2}$¢ a quart for milk. How much was our milk bill in a week, if we used 2 quarts a day?

29. By buying 25 cents worth of street car tickets, each ticket cost me $4\frac{1}{6}$ cents. Find the cost of 12 tickets.

30. A storekeeper made $1\frac{3}{4}$ cents on each can of corn. How much did he make on 18 cans?

31. A train averaging $30\frac{1}{2}$ miles an hour took 8 hours to go from Dare to Eden. What is the distance between these towns?

32. Mary used $1\frac{2}{3}$ yards of ribbon for a bow. How much did it take for 9 such bows?

33. Find the cost of a dozen eggs at $4\frac{1}{3}$ cents apiece.

34. 3 pounds of prunes cost 45 cents. How much did 12 pounds cost?

SUGGESTION. 12 pounds cost how many times the cost of 3 pounds?

Written Work

1. Multiply 18 by $14\frac{2}{3}$.

18

$14\frac{2}{3}$
————
$12 = \frac{2}{3}$ of 18

72

18
————
264

$14\frac{2}{3}$ times 18 means that $\frac{2}{3}$ of 18 is to be added to 14×18.

$\frac{2}{3}$ of $18 = 12$, which added to $14 \times 18 = 264$.

2. Find $25 \times 32\frac{2}{3}$.

$32\frac{2}{3}$

25
————
$\frac{50}{3} = 16\frac{2}{3}$

160

64
————
$816\frac{2}{3}$

This means that $25 \times \frac{2}{3}$ is to be added to 25×32. $25 \times \frac{2}{3} = \frac{50}{3}$, or $16\frac{2}{3}$, which added to $25 \times 32 = 816\frac{2}{3}$.

Find the products :

3. $7\frac{1}{2} \times 6$

4. $15\frac{1}{3} \times 9$

5. $27\frac{1}{6} \times 12$

6. $120\frac{1}{8} \times 40$

7. $216\frac{1}{10} \times 50$

8. $73\frac{1}{3} \times 15$

9. $140\frac{1}{4} \times 28$

10. $100\frac{1}{10} \times 60$

11. $95\frac{1}{5} \times 45$

12. $81\frac{1}{7} \times 21$

13. $120\frac{1}{3} \times 81$

14. $144\frac{1}{2} \times 108$

15. $150\frac{1}{15} \times 60$

16. $180\frac{1}{18} \times 18$

17. $8 \times 4\frac{1}{2}$

18. $10 \times 4\frac{1}{4}$

19. $9 \times 2\frac{2}{3}$

20. $12 \times 3\frac{2}{4}$

21. $11 \times 3\frac{3}{11}$

22. $14 \times 2\frac{2}{7}$

23. $12 \times 8\frac{1}{2}$

24. $6 \times 8\frac{1}{2}$	**40.** $20 \times 18\frac{1}{4}$	**56.** $124\frac{5}{6} \times 120$
25. $5 \times 3\frac{2}{5}$	**41.** $90 \times 15\frac{5}{6}$	**57.** $65\frac{3}{8} \times 32$
26. $10 \times 2\frac{2}{3}$	**42.** $50 \times 16\frac{1}{4}$	**58.** $116\frac{2}{3} \times 54$
27. $12 \times 3\frac{2}{3}$	**43.** $200 \times 15\frac{3}{20}$	**59.** $112\frac{3}{10} \times 50$
28. $20 \times 5\frac{2}{5}$	**44.** $20\frac{1}{20} \times 100$	**60.** $88\frac{2}{7} \times 28$
29. $45 \times 12\frac{7}{5}$	**45.** $42\frac{1}{11} \times 55$	**61.** $30\frac{5}{8} \times 160$
30. $120 \times 22\frac{2}{3}$	**46.** $64\frac{1}{13} \times 39$	**62.** $19\frac{7}{12} \times 24$
31. $154 \times 11\frac{6}{7}$	**47.** $72\frac{1}{14} \times 42$	**63.** $3\frac{7}{15} \times 60$
32. $96 \times 6\frac{2}{5}$	**48.** $102\frac{1}{16} \times 80$	**64.** $145\frac{3}{11} \times 55$
33. $144 \times 9\frac{1}{6}$	**49.** $125\frac{1}{24} \times 120$	**65.** $48\frac{6}{7} \times 84$
34. $80 \times 4\frac{5}{16}$	**50.** $12\frac{2}{3} \times 9$	**66.** $21\frac{1}{4} \times 16$
35. $125 \times 18\frac{2}{4}$	**51.** $14\frac{2}{5} \times 10$	**67.** $40\frac{1}{4} \times 25$
36. $72 \times 24\frac{5}{7}$	**52.** $20\frac{3}{4} \times 12$	**68.** $121\frac{6}{7} \times 49$
37. $100 \times 14\frac{7}{10}$	**53.** $35\frac{5}{8} \times 18$	**69.** $10\frac{5}{8} \times 18$
38. $132 \times 5\frac{5}{6}$	**54.** $95\frac{1}{2} \times 42$	**70.** $14\frac{7}{8} \times 24$
39. $168 \times 10\frac{5}{11}$	**55.** $100\frac{2}{5} \times 20$	**71.** $20\frac{1}{12} \times 84$

72. A book dealer purchases 125 books at wholesale at $1\frac{1}{5}$ each. Find the cost.

73. The fare between two cities on the Ft. Wayne R.R. is $10\frac{1}{2}$. Find the amount received from the sale of 50 tickets.

74. A newsdealer buys 300 papers at $1\frac{1}{4}$ cents each and sells them at 2 cents each. Find the cost and the gain.

75. A fruit dealer buys a barrel of apples for $4\frac{1}{2}$. The barrel contains 360 apples. He sells one half of them at the rate of 2 for 5 cents and the remainder at the rate of 3 for 5 cents. Find his profit.

SUGGESTION. At 2 for 5¢, 180 apples cost 90×5¢; at 3 for 5¢, 180 apples cost 60×5¢.

76. Find the cost of $16\frac{1}{2}$ yd. of cloth at $1.50 a yard.

The seller usually regards any part of a cent as an additional cent.

77. A clerk sold a customer $3\frac{1}{2}$ yd. serge @ $3.45, $2\frac{1}{4}$ yd. silk @ $1.75, and $4\frac{5}{8}$ yd. trimming @ $.95. Find the amount of the sales slip.

78. Find the total cost of $6\frac{3}{4}$ lb. fish @ 28 ¢ and a $3\frac{1}{4}$-pound chicken @ 48 ¢.

79. A clerk sold $5\frac{3}{8}$ yd. lace @ 40 ¢, $2\frac{5}{8}$ yd. ribbon @ 25 ¢, and $1\frac{1}{4}$ doz. buttons @ 85 ¢. Find the total of the sales slip.

80. How much change should I receive from $15 if I bought $3\frac{5}{8}$ yd. serge @ $2.50, $1\frac{7}{8}$ yd. silk @ $1.98, and $2\frac{1}{2}$ yd. lining @ $.25?

81. An airplane averaged $2\frac{5}{12}$ mi. a minute in a trial flight. How many miles an hour was this?

82. If the rate of sailing of a vessel was 18 mi. an hour, how far did it sail in $24\frac{1}{3}$ hr.?

83. A grocer bought 20 doz. lemons @ 25 ¢ and sold them at the rate of $2\frac{1}{2}$ ¢ each. Find the gain.

84. At $3\frac{4}{5}$ ¢ a pound find the cost of a bushel (60 lb.) of potatoes.

85. At $6\frac{1}{8}$ ¢ a pound find the cost of 15 lb. of rolled oats.

86. When pea beans are $12\frac{1}{2}$ ¢ a pound how much must be paid for 24 lb.?

87. Find the total amount paid for 10 lb. coffee @ $28\frac{1}{4}$ ¢, 4 lb. tea @ $32\frac{1}{4}$ ¢, 8 lb. rice @ $10\frac{3}{4}$ ¢.

88. Find the total amount paid for $2\frac{5}{8}$ yd. silk @ $1.75, $3\frac{1}{4}$ yd. lace @ $1.50, and $2\frac{3}{4}$ doz. buttons @ 85 ¢.

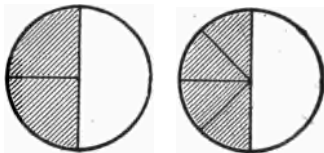**89.** If a train averages $30\frac{3}{4}$ mi. an hour, how far will it run in 18 hr.?

90. How much change should Alice get from $5 if she bought $3\frac{5}{8}$ yd. of ribbon @ 24 ¢ and $2\frac{1}{4}$ yd. of cretonne @ 56 ¢?

How to multiply a fraction by a fraction.

Oral and Written Work

1. What is $\frac{1}{2}$ of $\frac{1}{2}$ of a circle? $\frac{1}{4}$ of $\frac{1}{2}$ of a circle?

2. Show by a drawing what is meant by $\frac{1}{4}$ of $\frac{1}{8}$ of a square; by $\frac{1}{4}$ of $\frac{2}{8}$ of a square.

3. What is $\frac{1}{3}$ of 3 feet? $\frac{2}{8}$ of 3 feet?

4. What is $\frac{1}{3}$ of 3 fifths? $\frac{2}{8}$ of 3 fifths?

SOLUTION. $\frac{1}{3}$ of $\frac{3}{5} = \frac{1}{5}$; hence $\frac{2}{8}$ of $\frac{3}{5} = 2$ times $\frac{1}{5}$, or $\frac{2}{5}$.

Find:

5. $\frac{1}{2}$ of $\frac{4}{5}$	**7.** $\frac{2}{3}$ of $\frac{2}{7}$	**9.** $\frac{2}{3}$ of $\frac{5}{6}$
6. $\frac{1}{4}$ of $\frac{8}{9}$	**8.** $\frac{2}{3}$ of $\frac{6}{7}$	**10.** $\frac{3}{5}$ of $\frac{5}{6}$

11. What is $\frac{3}{4}$ of $\frac{5}{12}$?

SOLUTION. $\frac{1}{4}$ of $\frac{5}{12} = \frac{5}{48}$; hence $\frac{3}{4}$ of $\frac{5}{12} = 3 \times \frac{5}{48}$, or $\frac{15}{48}$. Observe that $\frac{3}{4}$ of $\frac{5}{12} = \frac{3 \times 5}{4 \times 12} = \frac{15}{48}$, or $\frac{5}{16}$.

Multiply the numerators together and the denominators together, and reduce the result to its lowest terms.

12. Find $\frac{3}{5} \times \frac{4}{7}$. This means the same as $\frac{3}{5}$ of $\frac{4}{7}$; $\frac{3}{5} \times \frac{4}{7} = \frac{12}{35}$.

Find the products:

13. $\frac{5}{8} \times \frac{5}{9}$	**16.** $\frac{3}{8} \times \frac{5}{6}$	**19.** $\frac{8}{9} \times \frac{6}{7}$	**22.** $\frac{3}{11} \times \frac{5}{6}$
14. $\frac{4}{7} \times \frac{8}{9}$	**17.** $\frac{5}{6} \times \frac{8}{11}$	**20.** $\frac{4}{5} \times \frac{8}{9}$	**23.** $\frac{2}{7} \times \frac{6}{7}$
15. $\frac{4}{5} \times \frac{4}{7}$	**18.** $\frac{6}{7} \times \frac{9}{10}$	**21.** $\frac{5}{7} \times \frac{4}{9}$	**24.** $\frac{3}{5} \times \frac{9}{10}$

25. Find $1\frac{1}{2} \times 1\frac{3}{4}$.

Change to improper fractions. Thus, $1\frac{1}{2} \times 1\frac{3}{4} = \frac{3}{2} \times \frac{7}{4} = \frac{21}{8}$, or $2\frac{5}{8}$.

26. $1\frac{2}{3} \times 2\frac{1}{2}$	**29.** $4\frac{1}{3} \times 2\frac{1}{2}$	**32.** $4\frac{2}{5} \times 7\frac{1}{4}$	**35.** $12\frac{1}{2} \times 4\frac{1}{5}$
27. $3\frac{1}{2} \times 2\frac{2}{5}$	**30.** $1\frac{1}{8} \times 2\frac{1}{4}$	**33.** $9\frac{2}{3} \times 12\frac{1}{2}$	**36.** $10\frac{2}{3} \times 3\frac{1}{8}$
28. $3\frac{1}{3} \times 1\frac{1}{3}$	**31.** $3\frac{3}{4} \times 1\frac{1}{2}$	**34.** $6\frac{1}{4} \times 9\frac{3}{4}$	**37.** $12\frac{1}{2} \times 12\frac{1}{2}$

How to use cancellation in multiplication of fractions.

Written Work

1. Find $\frac{2}{3}$ of $\frac{3}{5}$.

(1) $\dfrac{2}{3} \times \dfrac{3}{5} = \dfrac{6}{15}$, or $\dfrac{2}{5}$

(2) $\dfrac{2}{\cancel{3}} \times \dfrac{\cancel{3}}{5} = \dfrac{2}{5}$

In changing $\frac{6}{15}$ to $\frac{2}{5}$, both terms of the fraction are divided by 3. Hence, in finding the value of $\frac{2}{3} \times \frac{3}{5}$, the work may be shortened by rejecting the factor 3 from both dividend and divisor, as indicated in the second model.

The process of shortening operations by dividing both dividend and divisor by the same number is called **cancellation**.

2. Find the product of $\frac{2}{3} \times 7\frac{1}{2} \times 4$.

$\dfrac{\cancel{2}}{\cancel{3}} \times \dfrac{\overset{5}{\cancel{15}}}{\cancel{2}} \times \dfrac{4}{1} = \dfrac{20}{1} = 20.$

Change $7\frac{1}{2}$ to $\frac{15}{2}$. Then you have $\frac{2}{3} \times \frac{15}{2} \times \frac{4}{1}$. Cancel the 2's. Then cancel the factor 3 from the first denominator and the second numerator, leaving the factor 5 in the second numerator. The product of the remaining factors in the numerator is 20; in the denominator 1. Hence the answer is 20.

3. $\frac{5}{6} \times 2\frac{2}{7} \times 2$

4. $1\frac{3}{7} \times 4\frac{3}{8} \times 1\frac{1}{2}$

5. $4 \times 2\frac{1}{2} \times 1\frac{1}{5}$

6. $\frac{7}{8} \times 3 \times 4\frac{1}{2}$

7. $3 \times \frac{2}{3} \times \frac{3}{4}$

8. $5\frac{1}{2} \times 3\frac{1}{4} \times 4$

9. $6\frac{1}{3} \times 8 \times 2\frac{1}{4}$

10. $5\frac{1}{4} \times 2\frac{1}{3} \times 4$

11. $\frac{2}{3}$ of $\frac{3}{4} \times 6\frac{1}{2}$

12. $\frac{7}{8} \times 8 \times 12\frac{1}{4}$

13. $\frac{9}{10}$ of $3\frac{3}{4} \times 10$

14. $5\frac{1}{2} \times 2\frac{2}{11} \times 3\frac{1}{3}$

15. $5 \times 3\frac{1}{5} \times 3\frac{3}{8}$

16. $16\frac{1}{3} \times 4\frac{1}{5} \times 3$

17. At $9\frac{2}{3}$ a pair, find the cost of 15 pairs of lace curtains.

18. Edith knits 1 row of a sock in $\frac{2}{5}$ of a minute. How long does it take her to knit 25 rows?

19. At the rate of $33\frac{1}{4}$ miles an hour, how far will a train travel in $10\frac{3}{4}$ hours?

20. A load of coal weighs $5\frac{3}{8}$ tons. Find the cost at $8\frac{2}{3}$ a ton.

1. When the sugar allowance for each person was $2\frac{1}{2}$ table-spoonfuls a day, how many tablespoonfuls was it for a week ?

2. In a certain building, during January, $181\frac{9}{10}$ tons of soft coal were consumed. If the coal cost $6\frac{1}{4}$ a ton, what was the total expense for coal ?

3. If a soldier is allowed $\frac{3}{8}$ of a pound of meat a day, how much meat will supply 280 men for $6\frac{1}{2}$ days ?

4. A coal dealer sold 1850 tons of coal. $\frac{3}{5}$ of his sales were of anthracite coal ; the rest, of bituminous. The former he sold for $9\frac{1}{4}$ a ton ; the latter, for $6\frac{1}{4}$ a ton. How much were his total sales worth ?

5. A school was open $5\frac{3}{4}$ hours each day. How many hours was it open in a month of 20 school days ? in a term of $4\frac{1}{2}$ months ?

6. A boy lived $1\frac{3}{4}$ miles from his school and attended 150 days in the term. How many miles did he walk in a term both to and from school ?

7. A department store employed 120 clerks at $12\frac{3}{4}$ a week and 20 wrappers at $7\frac{3}{4}$ a week. Find the amount paid to all.

8. Find the cost of sewing buttons on 32 suits at $3\frac{7}{8}$¢ a suit.

9. At an average price of $4.17\frac{1}{2}$ each, find the cost of 20 war savings stamps necessary to fill a war savings certificate.

10. A rural mail carrier traveled $23\frac{7}{8}$ miles for each delivery. Find the number of miles he traveled in making 310 deliveries.

11. An ocean steamer burned on an average $201\frac{5}{16}$ tons of coal in a day. How much coal did it consume in a voyage of 7 days ?
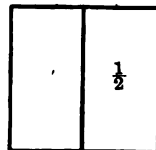
How to divide a whole number by a fraction.

Oral Work

1. How many halves are there in this square?

**2.** How many times is $\frac{1}{2}$ contained in 1?

3. How many railroad tickets at $\$\frac{1}{2}$ each can be bought for $\$1$? for $\$2$? for $\$4$?

$1 \div \frac{1}{2} = 2.$

4. What is the quotient of 2 *balls* divided by 1 *ball?* of 2 *cents* divided by 1 *cent?* of 2 *halves* divided by 1 *half?* of $\frac{2}{2} \div \frac{1}{2}$? What is the quotient of 4 *cents* divided by 2 *cents?* of 4 *halves* divided by 2 *halves*? of $\frac{4}{2} \div \frac{2}{2}$? of $\frac{6}{2} \div \frac{2}{2}$?

5. How many *fourths* are there in this square? What, then, is the quotient of 1 divided by $\frac{1}{4}$? of 2 divided by $\frac{1}{4}$?
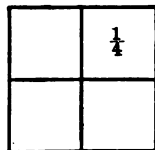
6. At $\$\frac{1}{4}$ each how many thrift stamps can be purchased for $\$1$? for $\$2$? for $\$3$?

7. What is the quotient of 4 *cents* divided by 1 *cent?* of 4 *fourths* divided by 1 *fourth?* of $\frac{4}{4} \div \frac{1}{4}$?

$1 \div \frac{1}{4} = 4.$

8. Since $1 = \frac{4}{4}$, is there any difference between the quotients of $1 \div \frac{1}{4}$ and $\frac{4}{4} \div \frac{1}{4}$? Since $2 = \frac{8}{4}$, is there any difference between the quotients of $2 \div \frac{1}{4}$ and $\frac{8}{4} \div \frac{1}{4}$? Since $3 = \frac{12}{4}$, is there any difference between the quotients of $3 \div \frac{1}{4}$ and $\frac{12}{4} \div \frac{1}{4}$?

9. Explain why $2 \div \frac{1}{2} = \frac{4}{2} \div \frac{1}{2}$; $\frac{2}{3} \div \frac{1}{4} = \frac{8}{12} \div \frac{3}{12}$; $\frac{5}{6} \div \frac{1}{5} = \frac{25}{30} \div \frac{6}{30}$.

Give the quotients:

10. $2 \div \frac{1}{2}$	**14.** $5 \div \frac{1}{3}$	**18.** $12 \div \frac{1}{2}$	**22.** $15 \div \frac{1}{4}$
11. $4 \div \frac{1}{2}$	**15.** $6 \div \frac{1}{4}$	**19.** $10 \div \frac{1}{2}$	**23.** $2 \div \frac{1}{5}$
12. $5 \div \frac{1}{2}$	**16.** $6 \div \frac{1}{3}$	**20.** $9 \div \frac{1}{2}$	**24.** $4 \div \frac{1}{8}$
13. $3 \div \frac{1}{3}$	**17.** $4 \div \frac{1}{5}$	**21.** $4 \div \frac{1}{8}$	**25.** $10 \div \frac{1}{4}$

How to divide any number by a fraction by inverting the terms of the divisor.

Oral Work

Just as 2 *inches* are contained in 3 *inches*, $1\frac{1}{2}$ times, or $\frac{3}{2}$ times, so 2 *thirds* are contained in 3 *thirds*, or one, $1\frac{1}{2}$ times or $\frac{3}{2}$ times. $1 \div \frac{2}{3} = \frac{3}{2}$.

1. How many times are 3 *inches* contained in 5 *inches?* 3 *fifths* in 5 *fifths*, or one? $1 \div \frac{3}{5} = ?$

When $\frac{1}{3}$ is changed to $\frac{3}{1}$, $\frac{2}{3}$ to $\frac{3}{2}$, or $\frac{3}{5}$ to $\frac{5}{3}$, the fraction is said to be **inverted.** It then shows how many times the fraction is contained in 1.

2. Invert the fractions $\frac{4}{5}$, $\frac{3}{10}$, $\frac{5}{8}$, $\frac{3}{5}$, $\frac{7}{8}$, $\frac{2}{3}$.

3. $1 \div \frac{1}{3} = ?$ $1 \div \frac{2}{5} = ?$ $1 \div \frac{3}{4} = ?$ $1 \div \frac{7}{8} = ?$

Notice that the quotient of 1 divided by any fraction equals the *fraction inverted.*

4. How many times is $\frac{3}{4}$ inch contained in 3 inches? 3 in. $\div \frac{3}{4}$ in. $= ?$ How many times is $\frac{3}{4}$ contained in 3? $3 \div \frac{3}{4} = ?$

Since $1 \div \frac{3}{4} = \frac{4}{3}$, therefore $3 \div \frac{3}{4} = 3 \times \frac{4}{3} = \frac{12}{3}$, or 4.

5. How many times is $\frac{3}{8}$ contained in $\frac{3}{4}$? $\frac{3}{4} \div \frac{3}{8} = ?$

Since $1 \div \frac{3}{8} = \frac{8}{3}$, therefore $\frac{3}{4} \div \frac{3}{8} = \frac{\overset{2}{\cancel{3}}}{\cancel{4}} \times \frac{\cancel{8}}{\cancel{3}} = 2$.

Notice that in each case you invert the terms of the divisor and then multiply.

Find the quotients by inverting the divisor and multiplying :

6. $1 \div \frac{1}{6}$	**13.** $2 \div \frac{2}{3}$	**20.** $8 \div \frac{7}{8}$	**27.** $15 \div \frac{2}{4}$
7. $1 \div \frac{2}{6}$	**14.** $6 \div \frac{3}{4}$	**21.** $16 \div \frac{3}{4}$	**28.** $16 \div \frac{2}{3}$
8. $1 \div \frac{2}{7}$	**15.** $4 \div \frac{4}{5}$	**22.** $24 \div \frac{4}{5}$	**29.** $12 \div \frac{4}{9}$
9. $1 \div \frac{5}{3}$	**16.** $5 \div \frac{5}{6}$	**23.** $20 \div \frac{4}{5}$	**30.** $8 \div \frac{7}{12}$
10. $1 \div \frac{3}{5}$	**17.** $6 \div \frac{7}{8}$	**24.** $15 \div \frac{3}{5}$	**31.** $7 \div \frac{6}{15}$
11. $1 \div \frac{3}{8}$	**18.** $9 \div \frac{9}{10}$	**25.** $30 \div \frac{2}{3}$	**32.** $6 \div \frac{5}{9}$
12. $1 \div \frac{5}{6}$	**19.** $10 \div \frac{4}{5}$	**26.** $12 \div \frac{5}{6}$	**33.** $9 \div \frac{7}{9}$

Written Work

1. Divide $\frac{3}{5}$ by $\frac{3}{10}$.

$$\frac{3}{5} \div \frac{3}{10} = \frac{\cancel{3}}{\cancel{5}} \times \frac{\cancel{10}^{2}}{\cancel{3}} = 2.$$

Invert the divisor and multiply, using cancellation.

2. Divide $4\frac{1}{2}$ by $\frac{3}{4}$.

$$4\frac{1}{2} = \frac{9}{2}$$

$$\frac{9}{2} \div \frac{3}{4} = \frac{\cancel{9}^{3}}{\cancel{2}} \times \frac{\cancel{4}^{2}}{\cancel{3}} = 6.$$

Change $4\frac{1}{2}$ to the improper fraction $\frac{9}{2}$. Invert the divisor and multiply, using cancellation. The result is 6.

Any number may be divided by a fraction by inverting the terms of the divisor and multiplying.

Find the quotients :

3. $26 \div \frac{1}{3}$	**9.** $1\frac{4}{5} \div \frac{9}{10}$	**15.** $1\frac{7}{8} \div \frac{3}{4}$
4. $3\frac{3}{4} \div \frac{2}{3}$	**10.** $18 \div \frac{1}{4}$	**16.** $2\frac{1}{5} \div \frac{3}{4}$
5. $25 \div \frac{1}{2}$	**11.** $48 \div \frac{2}{3}$	**17.** $16 \div \frac{2}{3}$
6. $2\frac{1}{2} \div \frac{3}{4}$	**12.** $12 \div 3\frac{1}{5}$	**18.** $3\frac{1}{2} \div \frac{7}{8}$
7. $2\frac{1}{8} \div \frac{1}{2}$	**13.** $16 \div \frac{4}{5}$	**19.** $5\frac{5}{8} \div \frac{3}{4}$
8. $3\frac{1}{3} \div \frac{1}{5}$	**14.** $1\frac{1}{3} \div \frac{2}{3}$	**20.** $8\frac{4}{9} \div 2\frac{2}{3}$

Divide:

21. 18 by $\frac{2}{3}$
22. 25 by $\frac{5}{8}$
23. 28 by $\frac{7}{9}$
24. 21 by $\frac{3}{7}$
25. 36 by $\frac{9}{10}$
26. 42 by $\frac{6}{11}$
27. 54 by $\frac{6}{7}$

28. 63 by $\frac{7}{8}$
29. 72 by $\frac{8}{9}$
30. 84 by $\frac{21}{25}$
31. 90 by $\frac{15}{16}$
32. 108 by $\frac{12}{18}$
33. 84 by $\frac{7}{12}$
34. 96 by $\frac{8}{9}$

35. 280 by $\frac{14}{15}$
36. 360 by $\frac{9}{16}$
37. 285 by $\frac{15}{18}$
38. 546 by $\frac{21}{26}$
39. 440 by $\frac{11}{20}$
40. 378 by $\frac{14}{15}$
41. 324 by $\frac{9}{14}$

42. Divide 36 by $3\frac{2}{5}$.

SUGGESTION. Change the divisor to an improper fraction.

43. 27 by $2\frac{1}{4}$.
44. 33 by $3\frac{2}{3}$
45. 44 by $4\frac{2}{5}$
46. 60 by $3\frac{3}{4}$
47. 76 by $4\frac{3}{4}$
48. 60 by $6\frac{2}{3}$

49. 84 by $4\frac{1}{5}$
50. 75 by $2\frac{7}{8}$
51. 90 by $3\frac{3}{4}$
52. 92 by $2\frac{3}{10}$
53. 85 by $1\frac{2}{3}$
54. 245 by $5\frac{5}{6}$

55. 780 by $7\frac{4}{5}$
56. 355 by $8\frac{7}{8}$
57. 295 by $6\frac{5}{9}$
58. 748 by $3\frac{2}{3}$
59. 549 by $8\frac{5}{7}$
60. 620 by $7\frac{3}{4}$

Find the quotients:

61. $7\frac{1}{2} \div 1\frac{1}{2}$
62. $6\frac{2}{3} \div 1\frac{2}{3}$
63. $5\frac{1}{4} \div 1\frac{3}{4}$
64. $8\frac{2}{3} \div 2\frac{1}{6}$
65. $7\frac{1}{3} \div 1\frac{1}{6}$
66. $3\frac{1}{2} \div 2\frac{1}{2}$

67. $12\frac{1}{2} \div 6\frac{1}{4}$
68. $14\frac{2}{7} \div 2\frac{6}{7}$
69. $3\frac{1}{4} \div 2\frac{1}{2}$
70. $5\frac{2}{3} \div 4\frac{1}{4}$
71. $6\frac{1}{8} \div 7\frac{1}{4}$
72. $8\frac{1}{3} \div 9\frac{1}{6}$

73. $3\frac{1}{6} \div 9\frac{1}{2}$
74. $3\frac{2}{7} \div 3\frac{1}{7}$
75. $8\frac{2}{5} \div 6\frac{1}{7}$
76. $9\frac{1}{4} \div 3\frac{1}{2}$
77. $3\frac{9}{10} \div 2\frac{2}{5}$
78. $6\frac{1}{2} \div 4\frac{1}{6}$

Divide:

79. $11\frac{2}{3}$ by $3\frac{2}{3}$
80. $6\frac{2}{3}$ by $1\frac{2}{3}$
81. $10\frac{2}{3}$ by $2\frac{2}{11}$

82. $4\frac{8}{15}$ by $1\frac{5}{12}$
83. $7\frac{7}{12}$ by $1\frac{3}{4}$
84. $7\frac{3}{5}$ by $2\frac{2}{3}$

85. $10\frac{4}{5}$ by $2\frac{4}{7}$
86. $15\frac{5}{8}$ by $2\frac{7}{8}$
87. $12\frac{3}{4}$ by $5\frac{3}{8}$

88. How much are buttons per dozen when 72 cents are paid for $2\frac{1}{4}$ dozen?

89. How many dolls' dresses can be cut from $8\frac{3}{4}$ yards of silk, if each dress requires $\frac{1}{8}$ yard?

90. A piece of ribbon containing 10 yards is cut into badges each $\frac{1}{8}$ of a yard in length. How many badges can be cut from the piece?

91. A clerk sells $6\frac{3}{4}$ yards of ribbon for 81 cents. What is the price per yard?

92. How many thrift stamps, at $\$\frac{1}{4}$ each, can be purchased for $\$16\frac{1}{2}$?

93. At $\$1\frac{1}{6}$ each, how many hats can be bought for $\$14\frac{2}{5}$?

94. A man earns $\$16\frac{1}{2}$ in $5\frac{1}{2}$ days. How much is this a day?

95. The cost of $3\frac{1}{2}$ pounds of sugar is 35 cents. What is the price per pound?

How to find what part one number is of another.

Oral Work

1. What part of 4 is 2?   2 is $\frac{1}{2}$ of 4. $\frac{2}{4} = \frac{1}{2}$.

2. What part of 4 is 3?   3 is $\frac{3}{4}$ of 4.

3. 4 is what part of 6?   4 is $\frac{4}{6}$ of 6, or $\frac{2}{3}$ of 6.

4. 8 is what part of 12?   8 is $\frac{8}{12}$ of 12, or $\frac{2}{3}$ of 12.

Notice in each case that the number immediately following "what part of" is the denominator and the other number the numerator of the fraction in the answer.

 5. What part of 10 is 5?   What part of 9 is 3?

6. What part of 16 is 4?   What part of 30 is 10?

7. In 1918 the price of eggs was 60 ¢ a dozen and in 1898 15 ¢ a dozen. What part of the 1918 price was the 1898 price? (What part of 60 ¢ is 15 ¢?)

8. Paul earns $\$15$ a week and Anna earns $\$10$. What part of Paul's earnings are Anna's?

Written Work

1. What part of 36 is 12?

$\frac{12}{36} = \frac{1}{3}$ Make the number 36, following "what part of", the denominator and the other number 12 the numerator of a fraction and reduce it to its lowest terms.

2. What part of $60 is $15?

3. What part of $48 is $16?

4. 60 is how many times 15?   48 is how many times 16?

60 = $\frac{60}{15}$, or 4, times 15.   48 = $\frac{48}{16}$, or 3, times 16.

Since $\frac{60}{15}$ and $\frac{48}{16}$ are improper fractions (or parts) we sometimes express the questions like those in Ex. 4 as follows:

5. What part of 15 is 60?   (*Ans.* $\frac{60}{15}$.)   What part of 16 is 48?   (*Ans.* $\frac{48}{16}$.)

6. When 6 quarts of milk cost 84¢, how much do 10 quarts cost?   15 quarts?   20 quarts?

SUGGESTION. $\frac{10}{6}$ of 84¢ = ? $\frac{15}{6}$ of 84¢ = ? $\frac{20}{6}$ of 84¢ = ?

7. Elizabeth buys 3 yards of ribbon for 25¢.   At the same rate, how much would she pay for 6 yards?

8. A woodsman cuts 15 cords of wood in 6 days.   How many cords, at the same rate, could he cut in 48 days?

9. In New York $9\frac{1}{4}$ inches of rain fell in 3 months.   At that rate, how much would fall in a year?

10. A man pays $3675 for 60 acres of land.   At the same rate, how much should he pay for 120 acres?

11. When 5 tons of coal cost $47.50, how much do 30 tons cost?

12. If 30 bushels of oats cost $25.50, how much do 60 bushels cost?

13. A man receives $7\frac{1}{2}$ for 2 days' work.   At the same rate, how much should he receive for 12 days' work?

14. A clerk earns $180 in 2 months.   At the same rate, how much does he earn in a year?

How to find a number when a fractional part of it is given.

Oral Work

1. A school team won 12 games of baseball, or $\frac{2}{3}$ of the games they played. How many games did they play?

SOLUTION. $\frac{2}{3} \times$ the games played = 12 games. Hence 12 is the product of the factor $\frac{2}{3}$ by another factor, which is the required number. Therefore the required number = $12 \div \frac{2}{3}$, or 18. (See second definition of *division*, p. 239.)

Find the number when:

2. $\frac{2}{3}$ of the number = 16	**7.** $\frac{6}{7}$ of the number = 12
3. $\frac{3}{4}$ of the number = 9	**8.** $\frac{9}{11}$ of the number = 36
4. $\frac{5}{6}$ of the number = 15	**9.** $\frac{5}{16}$ of the number = 60
5. $\frac{7}{8}$ of the number = 21	**10.** $\frac{5}{8}$ of the number = 45
6. $\frac{2}{7}$ of the number = 18	**11.** $\frac{7}{8}$ of the number = 28

12. There were 18 girls present. This number was $\frac{2}{3}$ of all the pupils in the class. How many pupils were there in the class?

13. James deposited $18 in the school savings bank, which was $\frac{3}{4}$ of what he earned during the month. How much did he earn in the month?

14. Mary spelled correctly 27 words, which were $\frac{9}{10}$ of all the words given. How many words were given?

15. A farmer sold 42 lambs, which were $\frac{6}{7}$ of his flock. How many lambs had he at first?

16. John attended school 40 days, or $\frac{2}{3}$ of the number of days in the term. Find the number of days in the term.

17. Mr. Tanner paid $12 each quarter for his telephone. At the same rate, how much did he pay in a year?

18. Mr. Haig spent $1200 a year for food. This was $\frac{2}{5}$ of his salary. What was his salary?

Written Work

1. Mr. Clark pays $600 for rent, which is $\frac{3}{10}$ of his salary. What is his salary?

$600 = $\frac{3}{10}$ × the salary. Hence $600 is the product of $\frac{3}{10}$ by another factor, which is the number of dollars of salary. Hence the salary = $600 ÷ $\frac{3}{10}$, or $2000.

$$\$600 \div \frac{3}{10} = \$\overset{200}{\cancel{600}} \times \frac{10}{\cancel{3}} = \$2000$$

Divide the number by the fraction.

Find the number when:

2. $\frac{8}{15}$ of the number = 56

3. $\frac{12}{25}$ of the number = 108

4. $\frac{5}{16}$ of the number = 275

5. $\frac{2}{3}$ of the number = 240 ft.

6. $\frac{9}{20}$ of the number = 378 bu.

7. $\frac{11}{12}$ of the number = 550 lb.

8. At a sale a sideboard was sold for $80 or $\frac{4}{5}$ of the regular price. What was the regular price?

9. The price of butter in 1918 was 60¢ a pound. This was $\frac{10}{3}$ of the price in 1898. What was the price in 1898?

10. Mr. Adams sold his farm for $13,608, which was $\frac{6}{5}$ of the cost. What was the cost of the farm?

11. A boy bought a sled at a sale for $1.50. This was $\frac{5}{8}$ of the original cost. What was the original cost?

The following sale prices were $\frac{2}{3}$ of the original prices of the articles. Find the original prices.

12. Gloves $1.50

13. Shoes $4.00

14. Hats $5.00

15. Suits $50.00

16. Waists $2.50

17. Skirts $4.50

18. Rugs $48.00

19. Lamps $8.50

20. Chairs $6.48

The following wholesale prices were $\frac{3}{4}$ of the retail prices. Find the retail prices.

21. Bags $3.15

22. Shirts $1.50

23. Caps $1.20

24. Belts $ 1.47

25. Coats $15.27

26. Skirts $ 6.60

27. Tables $12.45

28. Books $ 1.95

29. Clocks $ 2.52

1. My school desk is $2\frac{2}{3}$ feet long and $1\frac{1}{4}$ feet wide. Find the perimeter of the desk or the distance around it.

2. John lives $1\frac{3}{5}$ miles from the schoolhouse. After he has walked $\frac{2}{15}$ of a mile, how much farther has he to go?

3. A sheet of cardboard is $\frac{1}{12}$ of an inch thick. What is the thickness of a pile consisting of 30 sheets?

4. Arthur has a number of pads each $\frac{3}{4}$ of an inch thick, which he places in a pile. The pile measures 21 inches. How many pads are there in the pile?

5. How many badges of ribbon, each $1\frac{1}{4}$ yards long, can be cut from a piece of ribbon 10 yards long?

6. A remnant of $2\frac{7}{8}$ yards of silk costs $4.60. What is the price per yard?

7. How many feet of molding are required to extend around a room $20\frac{3}{4}$ feet long and $15\frac{2}{3}$ feet wide?

8. Ruth puts up jelly in glasses containing $\frac{5}{8}$ of a pint each. How much jelly is needed to fill 3 dozen glasses?

9. Mrs. Crane needs $23\frac{7}{8}$ yards of net for curtains. She gets three remnants, two of which measure $5\frac{1}{4}$ yards and $12\frac{1}{2}$ yards. What is the length of the third remnant?

10. Irene walks $2\frac{7}{10}$ miles an hour. How long does it take her to walk 9 miles?

11. How many glasses are required to put up $12\frac{1}{2}$ pints of jelly with $\frac{5}{8}$ of a pint in each?

12. When Ethel stands on the scale with her bag of books she weighs $80\frac{3}{4}$ pounds. Without the bag she weighs $76\frac{7}{8}$ pounds. What is the weight of the bag of books?

13. In one bookcase I have 152 books, which are $\frac{4}{25}$ of the total number I have. How many books have I?

1. How many times is $5¢$ contained in $\$1$? in $10¢$? in $20¢$? in $25¢$? in $50¢$?

2. Multiply $12\frac{1}{2}¢$ by 8.   How many times is $12\frac{1}{2}¢$ contained in $\$1$?

3. How many times is $8\frac{1}{3}¢$ contained in $\$1$?

SOLUTION. $8\frac{1}{3}¢ = \frac{25}{3}¢$. $100¢ \div \frac{25}{3}¢ = 12$.   Therefore $8\frac{1}{3}¢$ is contained 12 times in $\$1$.

4. Show, as in example 3, how many times $33\frac{1}{3}¢$ is contained in $\$1$.

5. Tell how many times 5 is contained in 100; in 10; in 20; in 25; in 50; in $6\frac{1}{4}$; in $16\frac{2}{3}$; in $12\frac{1}{2}$; in $8\frac{1}{3}$; in $33\frac{1}{3}$.

6. Learn the following table:

FRACTIONAL PARTS OF $\$1$:		FRACTIONAL PARTS OF 100:	
$50¢ = \$\frac{1}{2}$	$12\frac{1}{2}¢ = \$\frac{1}{8}$	$50 = \frac{1}{2}$ of 100	$12\frac{1}{2} = \frac{1}{8}$ of 100
$33\frac{1}{3}¢ = \$\frac{1}{3}$	$10¢ = \$\frac{1}{10}$	$33\frac{1}{3} = \frac{1}{3}$ of 100	$10 = \frac{1}{10}$ of 100
$25¢ = \$\frac{1}{4}$	$8\frac{1}{3}¢ = \$\frac{1}{12}$	$25 = \frac{1}{4}$ of 100	$8\frac{1}{3} = \frac{1}{12}$ of 100
$20¢ = \$\frac{1}{5}$	$6\frac{1}{4}¢ = \$\frac{1}{16}$	$20 = \frac{1}{5}$ of 100	$6\frac{1}{4} = \frac{1}{16}$ of 100
$16\frac{2}{3}¢ = \$\frac{1}{6}$	$5¢ = \$\frac{1}{20}$	$16\frac{2}{3} = \frac{1}{6}$ of 100	$5 = \frac{1}{20}$ of 100

Tell at sight what fractional part of a dollar each of the following is:

7. $6\frac{1}{4}¢$ **9.** $8\frac{1}{3}¢$ **11.** $12\frac{1}{2}¢$ **13.** $20¢$ **15.** $50¢$

8. $25¢$ **10.** $33\frac{1}{3}¢$ **12.** $16\frac{2}{3}¢$ **14.** $10¢$ **16.** $5¢$

What part of 100 is:

17. 50   **19.** $6\frac{1}{4}$ **21.** 20   **23.** $16\frac{2}{3}$ **25.** 5

18. 25   **20.** $8\frac{1}{3}$ **22.** $12\frac{1}{2}$ **24.** $33\frac{1}{3}$ **26.** $12\frac{1}{2}$

27. When gingham costs $12\frac{1}{2}$ ¢ a yard, what is the cost of 48 yards?

SOLUTION. $12\frac{1}{2}$ ¢ = $\$\frac{1}{8}$, cost of 1 yd.; $48 \times \$\frac{1}{8} = \$\frac{48}{8}$, or $\$6$, cost of 48 yd.

	NUMBER OF YARDS, POUNDS, ETC. PURCHASED	PRICE PER YARD, POUND, ETC.	TOTAL COST
28.	42 lb. coffee	$33\frac{1}{3}$ ¢	$\$14$
29.	32 lb. prunes	$12\frac{1}{2}$ ¢	?
30.	18 lb. raisins	$16\frac{2}{3}$ ¢	?
31.	48 boxes berries . . .	$8\frac{1}{3}$ ¢.	?
32.	80 qt. cranberries . . .	$6\frac{1}{4}$ ¢	?
33.	160 doz. lemons	20 ¢	?
34.	40 ball bats	25 ¢	?
35.	50 writing tablets . . .	2 for 25 ¢	?
36.	30 lb. nuts	50 ¢	?

37. Find the cost of 40 neckties at 25 ¢ each.
SOLUTION. 40 neckties at 25 ¢ ($\$\frac{1}{4}$) each cost $\$\frac{40}{4}$, or $\$10$.

Find the cost of:

38. 35 caps @ 50 ¢.

39. 48 toys @ $6\frac{1}{4}$ ¢.

40. 50 collars @ 25 ¢.

41. 72 yd. gingham @ $12\frac{1}{2}$ ¢.

42. 60 boxes berries @ $8\frac{1}{3}$ ¢.

43. 8 yd. ribbon @ $12\frac{1}{2}$ ¢.

44. 80 boys' shirts @ 50 ¢.

45. 21 yd. lawn @ $33\frac{1}{3}$ ¢.

46. 42 yd. lace @ $16\frac{2}{3}$ ¢.

47. 64 balls @ $6\frac{1}{4}$ ¢.

48. 40 oranges @ 5 ¢.

49. 32 melons @ $6\frac{1}{4}$ ¢.

50. 20 stamps @ 5 ¢.

51. 72 gas mantles @ $8\frac{1}{3}$ ¢.

52. 24 pads @ $12\frac{1}{2}$ ¢.

53. 40 collars @ $12\frac{1}{2}$ ¢.

54. Make problems asking for the cost of a given number of articles @ 20 ¢; @ 10 ¢; @ 25 ¢; @ 5 ¢; @ $33\frac{1}{3}$ ¢; @ 50 ¢; @ $12\frac{1}{2}$ ¢; @ $8\frac{1}{3}$ ¢; @ $6\frac{1}{4}$ ¢; @ $16\frac{2}{3}$ ¢.

55. Find by a short method the number of boxes of berries, at $8\frac{1}{3}$ ¢ each, that can be bought for $2.

SOLUTION.   As $8\frac{1}{3}$ ¢ is $ $\frac{1}{12}$, at $8\frac{1}{3}$ ¢ each you can buy 12 boxes for $ 1.00.   For $ 2 you can buy 2 × 12 boxes, or 24 boxes.

Make and solve problems with the following conditions:

COST PRICE	AMOUNT OF PURCHASE	NUMBER PURCHASED
56. 10 ¢ each	$ 3.00	?
57. $6\frac{1}{4}$ ¢ each	4.00	?
58. $12\frac{1}{2}$ ¢ each	5.00	?
59. $8\frac{1}{3}$ ¢ each	6.00	?
60. 20 ¢ each	7.00	?
61. 25 ¢ each	8.00	?
62. 50 ¢ each	20.00	?
63. $16\frac{2}{3}$ ¢ each	25.00	?
64. $6\frac{1}{4}$ ¢ each	10.00	?

Divide by the short method :

65. $ 2 by 10 ¢   **72.** $ 8 by 5 ¢   **79.** $ 12 by $12\frac{1}{2}$ ¢

66. $ 8 by 25 ¢   **73.** $ 12 by 10 ¢   **80.** $ 20 by $16\frac{2}{3}$ ¢

67. $ 5 by $6\frac{1}{4}$ ¢   **74.** $ 10 by $33\frac{1}{3}$ ¢   **81.** $ 40 by 20 ¢

68. $ 3 by $8\frac{1}{3}$ ¢   **75.** $ 12 by 50 ¢   **82.** $ 50 by $6\frac{1}{4}$ ¢

69. $ 4 by $12\frac{1}{2}$ ¢   **76.** $ 25 by $33\frac{1}{3}$ ¢   **83.** $ 16 by $12\frac{1}{2}$ ¢

70. $ 8 by $33\frac{1}{3}$ ¢   **77.** $ 70 by $6\frac{1}{4}$ ¢   **84.** $ 30 by $16\frac{2}{3}$ ¢

71. $ 9 by $16\frac{2}{3}$ ¢   **78.** $ 40 by $12\frac{1}{2}$ ¢   **85.** $ 20 by $33\frac{1}{3}$ ¢

86. Make problems asking for the number of articles @ $6\frac{1}{4}$ ¢, $16\frac{2}{3}$ ¢, 20 ¢, 25 ¢, 50 ¢, $8\frac{1}{3}$ ¢, $33\frac{1}{3}$ ¢, and $12\frac{1}{2}$ ¢, that can be purchased for a given amount of money.

Oral Work

A concrete number whose unit is a measure established by custom or by law is called a **denominate number**; as, 5 yards, in which 1 yard is the unit of measure, or 8 bushels, in which 1 bushel is the unit.

1. Give orally the table for measuring *liquids;* then write this table with proper abbreviations.

2. Write the names of some articles sold by *liquid* measure in a grocery store.

3. Give orally the table used for measuring *dry and bulky articles;* then write this table with proper abbreviations.

4. Write the names of some articles sold by *dry* measure in a grocery store.

5. Give orally the table used for measuring *coal, hay,* etc.; then write the table with proper abbreviations.

6. Give the names and the prices of different articles sold by the *hundredweight* or by the *ton.*

7. Give orally the table for measuring *time;* then write it with proper abbreviations.

8. Name the uses that are made of a *foot* ruler and a *yard*-stick.   What units of measure are used for measuring long distances?

9. Give orally the table used for measuring *distance;* then write it with proper abbreviations.

10. Write the names of the different measures, and write each of the following under its proper measure: milk, oil, vinegar, spices, oats, hay, molasses, sugar, rice, cloth, coal, potatoes, the length of the blackboard, the width of a page of your book.

Written Work

Changing to a lower denomination in denominate numbers, as 1 pk. to 8 qt., is just the same in principle as changing $\frac{1}{4}$ to $\frac{4}{16}$.

11. Change $1\frac{1}{2}$ pecks to quarts.

$$1 \text{ pk.} = 8 \text{ qt.}$$
$$1\frac{1}{2} \text{ pk.} = 1\frac{1}{2} \times 8 \text{ qt., or } 12 \text{ qt.}$$

Copy, and fill the blanks:

12. $3\frac{1}{2}$ pk. = —— qt.		**27.** $1\frac{1}{2}$ min. = —— sec.	
13. 1 bu. = —— pk.		**28.** $1\frac{3}{4}$ gal. = —— qt.	
14. $1\frac{3}{4}$ bu. = —— pk.		**29.** $3\frac{1}{4}$ pk. = —— qt.	
15. 16 qt. = —— pt.		**30.** 18 sq. yd. = —— sq. ft.	
16. $3\frac{1}{2}$ qt. = —— pt.		**31.** $8\frac{1}{4}$ yd. = —— ft.	
17. $8\frac{1}{4}$ ft. = —— in.		**32.** $2\frac{1}{4}$ sq. ft. = —— sq. in.	
18. 6 yd. = —— ft.		**33.** $\frac{7}{8}$ pk. = —— qt.	
19. 3 gal. = —— qt.		**34.** $\frac{3}{4}$ pk. = —— pt.	
20. $5\frac{1}{2}$ gal. = —— qt.		**35.** 5 lb. = —— oz.	
21. $6\frac{1}{2}$ lb. = —— oz.		**36.** $3\frac{1}{2}$ yd. = —— in.	
22. $6\frac{3}{4}$ lb. = —— oz.		**37.** $1\frac{3}{4}$ bu. = —— pt.	
23. $1\frac{3}{4}$ bu. = —— qt.		**38.** $\frac{3}{4}$ yd. = —— ft.	
24. $1\frac{1}{4}$ da. = —— hr.		**39.** $1\frac{7}{8}$ rd. = —— ft.	
25. $\frac{3}{4}$ pk. = —— qt.		**40.** $1\frac{1}{4}$ mi. = —— rd.	
26. $1\frac{3}{4}$ T. = —— lb.		**41.** $2\frac{1}{4}$ sq. ft. = —— sq. in.	

42. Change 36 feet to yards.

$$1 \text{ ft.} = \tfrac{1}{3} \text{ yd.} \quad 36 \text{ ft.} = \tfrac{36}{3} \text{ yd., or } 12 \text{ yd.}$$

Change :

43. 96 ft. to yards.

44. 36 pt. to gallons.

45. 24 pk. to bushels.

46. 128 oz. to pounds.

47. 32 qt. to gallons.

48. 48 hr. to days.

49. 168 gi. to quarts.

50. 960 pk. to bushels.

51. 540 in. to yards.

52. 15,840 ft. to miles.

53. 240 oz. to pounds.

54. 28,000 lb. to tons.

55. 1440 min. to hours.

56. 7200 sec. to hours.

57. 55 yd. to rods.

58. 129 ft. to yards.

59. 328 qt. to pecks.

60. 4000 lb. to tons.

61. 320 oz. to pounds

62. 54 in. to feet.

63. 640 pt. to pecks.

64. 224 qt. to bushels.

65. 66 ft. to rods.

66. 4160 rd. to miles.

67. 5000 lb. to tons.

68. 1500 sec. to minutes.

69. 147 da. to weeks.

70. 2880 min. to days.

71. 864 in. to yards.

72. 608 qt. to bushels.

73. James sold 8 qt. and 1 pt. of milk on Tuesday. How many pints did he sell?

8 qt. = 8 × 2 pt. = 16 pt.   Since 1 qt. = 2 pt., 8 qt. = 8 × 2 pt.,
1 pt.   = 1 pt.   or 16 pt.
_____
8 qt. 1 pt.   = 17 pt.   Therefore 8 qt. 1 pt. = 17 pt.

74. Henry picked 1 bu. 3 pk. of apples, and sold them at 25 ¢ a peck. How much did he receive for them?

75. Mary picked 1 bu. 1 pk. of cranberries, and sold them at 8 ¢ a quart. How much did she receive for them?

76. William worked 3 hr. and 20 min. each day at 10 ¢ an hour. How much did he earn in 6 days?

77. Nell hemstitched 1¾ doz. handkerchiefs at 3 ¢ apiece. How much did she receive for her work ?

78. George and Donald bought 1 bu. 3 pk. of potatoes at $1.52 a bushel, and planted them in the spring. In the fall they sold 60 bu. at 25 ¢ a half peck. How much did they realize from the sale of these potatoes ?

79. Mary helped her neighbor an hour and 40 minutes each day, for 10 ¢ an hour. How much did she earn in 6 days ?

80. Walter and Frank picked chestnuts on Saturday. Frank picked 7 qt. and Walter picked 5 qt. If they sold them at 5 ¢ a pint, how much did they get for them ?

81. Mr. Smith fed his horse 4 qt. of oats three times a day. At 80 ¢ a bushel how much were the oats worth in a month of 30 days ?

82. A boy earned 20 ¢ an hour. How much did he earn at that rate in 3 hr. and 45 min. ?

83. Play that you are picking fruit, such as plums, peaches, apples, etc., and selling it at so much per quart, peck, etc.

84. How much was gained in buying a bushel of apples at $1.00 and selling the apples at 20 ¢ a half peck ?

85. How much was gained in buying a bushel of onions at $2.10 a bushel and selling the onions at 5 ¢ a pound (57 lb. = 1 bu.) ?

86. James sold from his school garden ½ a bushel of peas at 15 ¢ a quart, 7 qt. of string beans at 15 ¢ a quart, and a quarter peck of lima beans at 7 ¢ a quart. How much did he receive in all for these vegetables ?
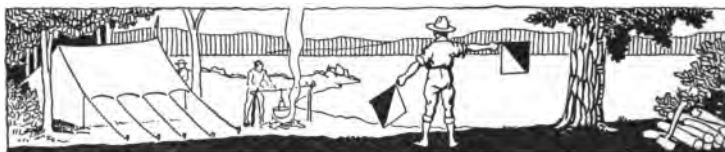
87. At 8 ¢ a pint, find the cost of 6 gal. 1 pt. of milk.

88. At 10 ¢ a quart, find the cost of 4 bu. 2 pk. of beans.

89. At 4 ¢ an ounce, find the cost of 3 lb. 3 oz. of ginger.

90. At 36 ¢ a pound, find the cost of 29 lb. of nut butter.

Boy Scouts

1. A boy scout found that he took 40 steps to 100 ft. What was the length of his step in feet? in inches?

2. A mile is $52\frac{4}{5}$ times 100 ft. How many steps did the boy take to a mile?

3. Find the cost of the following outfit for a troop of 32 boy scouts:

Hat,	$1.75	Belt,	$ .50	Knife,	$1.25
Coat,	$2.15	Neckerchief,	$ .35	First-aid kit,	$ .40
Breeches,	$1.85	Blanket,	$1.50	Watch,	$1.50
Shirt,	$1.50	Haversack,	$2.00	Compass,	$ .75
Leggings,	$1.30	Ax and sheath,	$1.25	Two signal flags,	$1.50

4. In a swimming contest a boy scout swam 100 yd. in $74\frac{1}{5}$ sec. At this rate, how long would it take him to swim 150 yd.?

5. A boy scout walked on an average $2\frac{7}{8}$ mi. an hour. How long did it take him to walk 9 mi.?

6. What is the area of a scout tent 6 ft. × $7\frac{1}{2}$ ft.? $7\frac{1}{2}$ ft. × 8 ft.? $6\frac{1}{4}$ ft. square?

7. The following is a ration list for 6 boys for three meals. At this rate, find the cost of three meals for 24 boys.

2 lb. bacon @	$.52	3 cans salmon @	$.25
1 lb. butter @	$.50	1 lb. sugar @	$.10
1 doz. eggs @	$.47	24 potatoes for	$.25
½ lb. cocoa @	$.24	2 cans condensed milk @	$.16
½ lb. coffee @	$.30	1 small package self-raising	
¼ lb. chocolate @	$.40	flour @	$.12

Girl Scouts

1. These girl scouts cooked a camp breakfast for their troop of 24 girls. They used $\frac{1}{2}$ lb. oatmeal @ $.12, 1$\frac{1}{4}$ lb. bacon @ $.52, 2 loaves of bread for toast @ $.10, 1$\frac{1}{8}$ lb. butter @ $.56, 1 lb. coffee @ $.30, 8 qt. milk @ $.15, and 1$\frac{1}{2}$ lb. sugar @ $.10. Find the total cost of the breakfast and the cost for each girl.

2. A girl scout walked 100 mi. during July. The first week she walked 18$\frac{3}{8}$ mi.; the second week, 20$\frac{3}{4}$ mi.; the third week, 22$\frac{7}{8}$ mi.; and the fourth week, 28$\frac{3}{16}$ mi. How far did she walk the last three days?

3. The Ivy Troop consisted of 4 patrols of 8 members each. Find the cost of this outfit for the troop of 32 girls.

Skirt,	$2.35	Haversack,	$1.60
Middy,	$2.75	Belt,	$1.65
Coat,	$3.25	Knife,	$1.50
Bloomers,	$2.00	First-aid kit,	$ .50
Hat,	$1.65	Sewing kit,	$ .25
Neckerchief,	$ .30		

4. Ruth won the service badge by the following tasks:

(*a*) She made surgical dressings for 30 hr. in a Red Cross workroom. She averaged 1$\frac{1}{4}$ hr. a day. How many days did she work?

(*b*) She raised vegetables on a plot 15 ft. × 16$\frac{2}{3}$ ft. She paid $2.00 for seeds and fertilizer and sold her vegetables for $7.00. What was her profit per square foot of land?

5. Alice won the green cross badge by taking care of her little sister 30 hr. in June. The first 14 days she worked 1$\frac{1}{4}$ hr. each day. How much did she average each day for the remaining days?

Find how long it takes you to get the *right answers* to each set of five examples.

I

1. $\frac{1}{3} + \frac{3}{4} + \frac{5}{16}$
2. $\frac{4}{5} - \frac{2}{3}$
3. $6 \times \frac{2}{3}$
4. $24 \div \frac{3}{4}$
5. $48 \times \$.12\frac{1}{2}$

II

1. $1\frac{2}{3} + 4\frac{3}{16} + 3\frac{3}{4}$
2. $\frac{7}{8} - \frac{3}{16}$
3. $5 \times \frac{3}{8}$
4. $300 \div \frac{3}{16}$
5. $21 \times \$.33\frac{1}{3}$

III

1. $20\frac{2}{3} + 43\frac{1}{4} + 39\frac{1}{8}$
2. $12\frac{3}{10} - 4\frac{2}{3}$
3. $\frac{5}{8}$ of 50
4. $150 \div 3\frac{3}{4}$
5. $24 \times \$.16\frac{2}{3}$

IV

1. $12\frac{1}{10} + 14\frac{1}{8} + 23\frac{2}{5}$
2. $48\frac{3}{16} - 29\frac{5}{8}$
3. $10\frac{2}{3} \times 36$
4. $12\frac{1}{2} + \frac{5}{8}$
5. $16 \times \$.06\frac{1}{4}$

V

1. $17\frac{1}{3} + 18\frac{5}{6} + 33\frac{3}{4}$
2. $\frac{3}{4} + \frac{7}{8} - \frac{1}{2}$
3. $\frac{2}{3}$ of $\frac{4}{5}$
4. $5\frac{3}{4} \div 3\frac{2}{7}$
5. $\$1.00 - \$.12\frac{1}{2}$

VI

1. $\frac{1}{2} + \frac{5}{6} + \frac{3}{4} + \frac{5}{12}$
2. $\frac{2}{3} + \frac{7}{12} - \frac{5}{6}$
3. $\frac{9}{10}$ of $\frac{7}{8}$
4. $600 = \frac{5}{6}$ of ?
5. $\$1.00 \div \$.33\frac{1}{3}$

VII

1. $\frac{2}{3} + \frac{1}{10} + \frac{3}{5} + \frac{1}{12}$
2. $33\frac{1}{3} + 12\frac{1}{2} - 5\frac{5}{6}$
3. $8\frac{1}{2} \times 3\frac{3}{4}$
4. $700 = \frac{7}{8}$ of ?
5. $\$6.00 \div \$.16\frac{2}{3}$

VIII

1. $\frac{3}{8} + \frac{5}{16} + \frac{5}{32} + \frac{3}{4}$
2. $29\frac{3}{10} + 13\frac{1}{5} - 8\frac{2}{5}$
3. $10\frac{1}{4} \times 10\frac{5}{8}$
4. $\frac{3}{16}$ of ? $= 48$
5. $\$3.00 \div \$.33\frac{1}{3}$

CHAPTER VIII

Oral Work

Add rapidly the following scores in a bean-bag game :

	a	b	c	d	e	f	g	h	i	j	k
1.	5	7	0	6	5	6	5	7	9	0	8
	6	8	5	5	6	5	0	5	0	8	7
	5	5	8	7	0	0	5	7	7	0	8
	8	0	7	7	8	8	6	8	5	6	5
	9	6	8	8	7	9	6	5	6	9	9
	—	—	—	—	—	—	—	—	—	—	—

Written Work

Add, observing groups that make 5, 10, 15, 20, etc.   Test by adding downwards:

1. 14,223	**2.** 54,724	**3.** 60,000	**4.** 70,927
37,245	57,632	59,725	52,051
45,936	18,206	34,761	61,847
50,649	32,391	9,892	42,536
3,261	1,001	47,634	9,910
702	955	1,078	49,068
30,485	1,417	21,046	5,099

Add and test:

5.	6.	7.	8.
83,313	14,542	21,424	90,009
91,737	43,036	97,835	56,721
41,952	83,355	42,067	97,856
10,090	44,492	72,109	23,081
79,973	40,001	19,055	59,039
5,681	10,088	64,562	17,840
22,200	80,063	8,778	60,029
79,942	56,702	60,021	60,072

Explain what must be observed in setting down these sums to be added. Then add and test :

9.	10.	11.	12.
$ 4.40	$ 5.10	$ 9.10	$ 5.19
82.02	26.98	15.10	29.10
43.00	34.25	27.75	88.25
12.05	76.80	105.05	56.10
498.04	155.05	73.10	34.50

13.	14.	15.	16.
$ 8.07	$ 3.75	$ 6.50	$ 8.20
92.09	49.10	35.52	29.25
21.10	34.50	1.00	.01
34.02	62.98	23.06	75.50
82.75	1.65	17.10	63.50
59.01	25.60	181.19	43.92

17.	18.	19.	20.
$ 4.29	$ 5.60	$804.98	$546.05
23.72	29.01	714.09	3012.99
81.70	38.19	326.50	590.68
36.01	42.05	995.27	69.10
49.25	74.92	77.76	7276.23
31.07	81.74	558.50	19.08
64.01	25.40	23.17	329.00
52.90	19.10	655.55	4538.50

Oral Work

1. Explain the terms used in subtraction.

2. From 74 take 53.   Thus, $74 - 50 = 24$; $24 - 3 = 21$.

Find differences :

	a	b	c	d	e
3.	95 — 39	63 — 47	76 — 54	15 — 5	60 — 45
4.	58 — 29	90 — 64	50 — 25	35 — 16	87 — 42
5.	71 — 48	81 — 47	78 — 39	56 — 42	67 — 45
6.	54 — 25	78 — 48	67 — 48	99 — 68	25 — 15
7.	71 — 69	88 — 29	58 — 39	23 — 15	89 — 52
8.	39 — 26	80 — 65	45 — 28	54 — 37	90 — 54
9.	58 — 34	45 — 26	60 — 40	77 — 62	85 — 43

Written Work

Subtract and test. Time your work. Then work the exercises again and try to beat your record :

	a	b	c	d	e	f
1.	304	740	985	508	703	745
	289	387	507	390	598	690
2.	9708	4503	5207	3052	4163	8157
	3201	4292	1908	2954	2491	3299
3.	4140	4159	1908	4507	4562	3875
	2977	2786	1454	2972	3989	2651
4.	4062	5098	6703	5192	5099	3029
	3903	3673	4487	4066	4897	2544

Subtract and test :

	a	*b*	*c*	*d*
5.	40,092	70,900	60,251	70,098
	29,819	54,892	39,807	58,919
6.	503,459	623,559	560,734	600,127
	423,602	454,683	384,842	576,774
7.	$ 250.10	$ 892.15	$ 3.726	$ 22.60
	7.42	64.01	.993	1.60
8.	$ 328.67	$ 801.98	$ 27.021	$ 5241.09
	115.01	572.89	19.011	3174.77
9.	$ 3245.90	$ 9108.60	$ 285.99	$ 314.291
	2921.01	7299.01	192.10	189.189
10.	$ 2965.10	$ 1985.20	$ 7818.05	$ 421.987
	1824.01	465.99	659.16	128.243
11.	$ 2009.70	$ 600.90	$ 709.05	$ 700.00
	389.99	398.98	29.87	334.09
12.	$ 4008.60	$ 2690.00	$ 7785.00	$ 6100.01
	487.98	348.98	649.65	78.49
13.	$ 9398.01	$ 8500.00	$ 2008.40	$ 2670.00
	7246.99	6356.29	1268.98	1598.54
14.	$ 1400.00	$ 8780.20	$ 1980.00	$ 4467.01
	1250.75	2563.52	845.24	2247.87
15.	$ 1240.11	$ 6475.14	$ 9550.01	$ 4498.11
	1150.00	4243.87	2480.19	1177.98

Oral Work

1. Repeat the multiplication tables to 12 × 12.

2. Multiply first by 10 ; then by 100 ; then by 1000 :
4, 8, 12, 15, 18, 25, 30, 35, 40, 50, 75.

3. State how the addition of one zero, two zeros, three zeros, etc., to the right of a number affects its value.

Written Work

NOTE.   Wherever possible, use *short methods.*   Thus, 11 × 1860 = 10 × 1860, + 1 × 1860, or 18,600 + 1860.

Find the products :

1. 40 × 20	**18.** 68 × 30	**35.** 156 × 3204
2. 20 × 20	**19.** 30 × 70	**36.** 125 × 4009
3. 27 × 35	**20.** 67 × 49	**37.** 609 × 3220
4. 39 × 47	**21.** 53 × 62	**38.** 522 × 3044
5. 84 × 67	**22.** 65 × 98	**39.** 399 × 5673
6. 98 × 42	**23.** 45 × 80	**40.** 968 × 3404
7. 34 × 23	**24.** 99 × 999	**41.** 957 × 1505
8. 56 × 76	**25.** 12 × 1400	**42.** 968 × 9566
9. 30 × 102	**26.** 15 × 2500	**43.** 490 × 5707
10. 45 × 490	**27.** 16 × 1500	**44.** 960 × 7658
11. 68 × 304	**28.** 20 × 1339	**45.** 850 × 4309
12. 50 × 206	**29.** 35 × 3000	**46.** 869 × 2507
13. 54 × 600	**30.** 22 × 25	**47.** 960 × 5003
14. 72 × 503	**31.** 25 × 24	**48.** 101 × 8002
15. 40 × 725	**32.** 32 × 25	**49.** 110 × 4501
16. 68 × 507	**33.** 19 × 45	**50.** 948 × 7620
17. 75 × 462	**34.** 18 × 35	**51.** 859 × 6573

Oral Work

Divide the following numbers first by 6; then by 5 ; by 4 ; by 7 ; 8 ; 9 ; 10 ; 11 ; 12 ; 20 :

	a	b	c	d	e
1.	432	624	709	8140	9102
2.	354	248	900	9210	7054
3.	816	526	806	7000	6033

Written Work

Find the quotients and test :

1. $9500 \div 20$

2. $5060 \div 45$

3. $5965 \div 56$

4. $9543 \div 34$

5. $4516 \div 87$

6. $9842 \div 79$

7. $9819 \div 95$

8. $444,444 \div 19$

9. $459,606 \div 72$

10. $45,675 \div 93$

11. $486,501 \div 41$

12. $96,543 \div 62$

13. $548,672 \div 33$

14. $56,400 \div 54$

15. $10,456 \div 30$

16. $\frac{468502}{20}$

17. $\frac{352185}{7}$

18. $\frac{104658}{55}$

19. $333,333 \div 51$

20. $459,875 \div 65$

21. $648,650 \div 76$

22. $185,679 \div 18$

23. $93,567 \div 40$

24. $50,617 \div 10$

25. $445,119 \div 15$

26. $590,170 \div 25$

27. $7688 \div 31$

28. $567,800 \div 24$

29. $50,875 \div 25$

30. $65,700 \div 40$

31. $99,660 \div 33$

32. $36,550 \div 10$

33. $15,789 \div 15$

34. $484,800 \div 48$

35. $25,560 \div 18$

36. $4488 \div 22$

37. $77,445 \div 860$

38. $249,681 \div 120$

39. $386,406 \div 200$

40. $10,505 \div 500$

41. $60,840 \div 600$

42. $72,400 \div 800$

43. $97,009 \div 694$

44. $78,007 \div 892$

45. $52,475 \div 623$

46. $70,601 \div 961$

47. $70,075 \div 560$

48. $42,882 \div 745$

49. $48,618 \div 125$

50. $26,099 \div 900$

51. $14,014 \div 145$

52. $300,909 \div 308$

53. $56,630 \div 706$

54. $367,047 \div 734$

Oral Work

What is the cost of :

1. 10 lb. of cherries at 25 ¢ a pound ?

2. 9 pt. of milk at 7 ¢ a pint ?

3. 8 bu. of apples at $ 2 a bushel ?

4. A 12-pound cheese at 20 ¢ a pound ?

5. 3 pk. of apples at 25 ¢ a peck ?

6. ½ pk. beans at 80 ¢ a peck ?

7. 7 baskets peaches at $ 1.25 a basket ?

8. 10 tons coal at $ 8.50 a ton ?

9. A boy rides his wheel 6 mi. in one hour.   How far does he ride in 7¾ hr.?

10. A man leaves home at 6.30 A.M. and returns at 5.45 P.M.   How long is he away from home ?

11. A train leaves the station at 11.10 A.M.   It requires 25 min. to reach the station.   At what time must I leave home in order to catch this train ?

12. Harry leaves for school at 8.30 A.M., and reaches school at 3 minutes before 9 o'clock.   How long is he on the way ?

13. The morning session of school begins at 9 A.M. and closes at 11.30 A.M.   The afternoon session begins at 1 P.M. and closes at 3.45 P.M.   How long in hours and minutes are both sessions ?

14. A dealer buys 150 bales of hay, averaging 90 lb. to the bale.   How many tons and pounds over does he buy ?

15. At 3 ¢ an ounce, how much will 1 lb. of mustard cost ?

16. Find the cost of 100 lb. of nails at 8½ ¢ a pound.

Written Work

1. 2 tons of rolled oats are packed in pound packages. How many packages are there?

2. How many ounces are there in a ton?

3. A load of hay weighs 3000 lb. How many tons does it weigh? What is its value at $14 a ton?

4. Mr. Black feeds his horse 6 qt. of oats 3 times a day. How many bushels of oats does he feed the horse during November, December, and January?

5. How many 8-oz. packages of soda can be put up from 1 ton 300 lb. of soda?

6. A field is 1320 ft. long and 320 ft. wide. How many yards is it around the field?

7. There are 5280 ft. in a mile. How many feet is it from Albany to New York, a distance of 143 mi.?

8. How many feet of picture molding are required for a room 12 ft. wide and 18 ft. long? At 10¢ a foot, how much does it cost?

9. Each of 8 boxes holds 5 lb. 4 oz. of meal. How much do all the boxes hold?

10. What is the cost of 8 barrels of vinegar, averaging 41 gal. 3 qt. a barrel, at 25¢ a gallon?

11. A building is 46 ft. 3 in. wide, and twice as long as wide. Find the distance around the building.

12. Mr. Bell picks 510 pk., 380 pk., and 467 pk. of apples. How many bushels and pecks does he pick?

13. Let each pupil write and solve 5 *two-step* problems about farms, gardens, purchases in store, etc.

1. Change to eighths: $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, \frac{2}{4}$.

2. Change to twelfths: $\frac{2}{3}, \frac{3}{6}, \frac{2}{4}, \frac{1}{3}, \frac{3}{4}, \frac{1}{2}, \frac{5}{6}$.

3. Change to sixteenths: $\frac{2}{8}, \frac{3}{4}, \frac{1}{2}, \frac{7}{8}, \frac{4}{8}, \frac{3}{8}$.

4. Change $\frac{8}{12}$ to thirds, $\frac{5}{10}$ to halves, $\frac{8}{16}$ to fourths.

Change to lowest terms:

5. $\frac{4}{6}, \frac{6}{12}, \frac{4}{8}, \frac{9}{12}, \frac{4}{16}, \frac{8}{24}$.

6. $\frac{2}{8}, \frac{10}{12}, \frac{8}{16}, \frac{10}{24}, \frac{10}{20}$.

7. $\frac{8}{32}, \frac{4}{24}, \frac{9}{36}, \frac{12}{48}, \frac{11}{22}, \frac{12}{18}, \frac{25}{75}$.

8. $\frac{4}{12}, \frac{8}{12}, \frac{10}{50}, \frac{8}{12}, \frac{16}{48}, \frac{24}{48}, \frac{15}{45}, \frac{15}{20}$.

9. $\frac{15}{24}, \frac{16}{32}, \frac{20}{30}, \frac{14}{28}, \frac{40}{60}, \frac{18}{27}, \frac{6}{8}$.

10. $\frac{18}{36}, \frac{12}{26}, \frac{14}{24}, \frac{9}{45}, \frac{7}{63}, \frac{6}{16}, \frac{9}{81}, \frac{15}{85}$.

Read as improper fractions:

11. $3\frac{3}{4}, 4\frac{2}{3}, 5\frac{7}{12}, 5\frac{3}{8}, 4\frac{5}{6}, 5\frac{3}{8}, 9\frac{5}{16}$.

12. $14\frac{5}{12}, 5\frac{1}{3}, 6\frac{3}{8}, 8\frac{3}{4}, 5\frac{5}{8}, 4\frac{3}{8}, 5\frac{3}{8}$.

13. $2\frac{1}{4}, 3\frac{3}{8}, 6\frac{2}{3}, 4\frac{3}{4}, 6\frac{3}{4}, 5\frac{7}{12}, 4\frac{11}{12}$.

14. $8\frac{2}{3}, 3\frac{1}{5}, 4\frac{3}{10}, 5\frac{3}{8}, 4\frac{3}{4}, 3\frac{7}{12}$.

You have learned that a fraction is a **part of a unit**. Thus, $\frac{1}{2} = \frac{1}{2}$ of 1, $\frac{1}{3} = \frac{1}{3}$ of 1, $\frac{2}{3} = \frac{1}{3}$ of 2 or $\frac{2}{3}$ of 1, $\frac{3}{4} = \frac{1}{4}$ of 3 or $\frac{3}{4}$ of 1.

You have learned also that a fraction may be regarded as an **expression of division** in which the numerator is the dividend and the denominator, the divisor. Thus, $\frac{1}{2} = 1 \div 2$, $\frac{1}{3} = 1 \div 3$, $\frac{2}{3} = 2 \div 3$; $\frac{16}{5} = 16 \div 5 = 3\frac{1}{5}$; $\frac{16}{4} = 16 \div 4 = 4$.

Change to integers or mixed numbers by dividing the numerator by the denominator:

15. $\frac{15}{3}, \frac{12}{4}, \frac{9}{3}, \frac{12}{6}, \frac{24}{6}, \frac{10}{5}, \frac{48}{12}, \frac{15}{5}, \frac{12}{6}, \frac{18}{3}, \frac{24}{4}$.

16. $\frac{8}{2}, \frac{13}{3}, \frac{11}{4}, \frac{15}{6}, \frac{7}{2}, \frac{17}{5}, \frac{19}{6}, \frac{21}{8}, \frac{19}{4}, \frac{21}{4}, \frac{47}{8}$.

Change to integers or mixed numbers:

17. $\frac{32}{8}$, $\frac{31}{6}$, $\frac{42}{7}$, $\frac{48}{16}$, $\frac{16}{8}$, $\frac{56}{7}$, $\frac{28}{6}$, $\frac{14}{4}$, $\frac{27}{8}$.

18. $\frac{64}{8}$, $\frac{25}{2}$, $\frac{21}{7}$, $\frac{45}{9}$, $\frac{72}{9}$, $\frac{14}{7}$, $\frac{84}{8}$, $\frac{12}{2}$, $\frac{15}{4}$.

19. $\frac{56}{8}$, $\frac{36}{9}$, $\frac{81}{9}$, $\frac{42}{4}$, $\frac{17}{3}$, $\frac{18}{3}$, $\frac{52}{5}$, $\frac{18}{12}$, $\frac{24}{12}$.

20. $\frac{54}{12}$, $\frac{37}{12}$, $\frac{14}{8}$, $\frac{48}{16}$, $\frac{50}{16}$, $\frac{68}{8}$, $\frac{29}{7}$, $\frac{48}{9}$, $\frac{50}{16}$.

The **ratio** of two numbers of the same kind is found by dividing the first by the second. Thus, the ratio of 4 to 8 is $4 \div 8$, or $\frac{4}{8}$, or $\frac{1}{2}$. The ratio of 8 to 4 is $8 \div 4$, or 2. The ratio of 3 ft. to 4 ft. is $3 \div 4$, or $\frac{3}{4}$. The ratio of 4 to 3 is $\frac{4}{3}$.

Give the ratio of:

21. 2 to 3	**25.** 10 to 5	**29.** 5 to 10	**33.** 20 to 30
22. 4 to 5	**26.** 3 to 9	**30.** 15 to 20	**34.** 30 to 20
23. 6 to 8	**27.** 7 to 10	**31.** 8 to 12	**35.** 25 to 75
24. 1 to 7	**28.** 9 to 3	**32.** 5 to 15	**36.** 75 to 25

Change to like or similar fractions:

37. $\frac{1}{4}$ and $\frac{1}{6}$	**41.** $\frac{1}{6}$ and $\frac{1}{12}$	**45.** $\frac{1}{4}$ and $\frac{2}{7}$
38. $\frac{2}{3}$ and $\frac{3}{5}$	**42.** $\frac{2}{3}$ and $\frac{1}{4}$	**46.** $\frac{2}{3}$ and $\frac{1}{6}$
39. $\frac{3}{8}$ and $\frac{2}{4}$	**43.** $\frac{3}{4}$ and $\frac{1}{6}$	**47.** $\frac{3}{8}$ and $\frac{1}{4}$
40. $\frac{5}{8}$ and $\frac{3}{4}$	**44.** $\frac{2}{3}$ and $\frac{3}{5}$	**48.** $\frac{3}{4}$ and $\frac{1}{2}$

Change to fractions having their l. c. d.:

49. $\frac{3}{4}$, $\frac{1}{2}$, $\frac{3}{8}$	**51.** $\frac{1}{3}$, $\frac{2}{4}$, $\frac{3}{10}$	**53.** $\frac{3}{4}$, $\frac{5}{8}$, $\frac{3}{16}$	**55.** $\frac{2}{3}$, $\frac{1}{4}$, $\frac{7}{8}$
50. $\frac{3}{4}$, $\frac{1}{2}$, $\frac{2}{5}$	**52.** $\frac{2}{3}$, $\frac{2}{9}$, $\frac{3}{10}$	**54.** $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$	**56.** $\frac{3}{10}$, $\frac{4}{5}$, $\frac{2}{3}$

ADDITION AND SUBTRACTION OF FRACTIONS

Find the sums:

1. $\frac{3}{4}$ and $\frac{3}{16}$	**4.** $1\frac{5}{16}$ and $\frac{5}{12}$	**7.** $\frac{7}{20}$ and $\frac{1}{4}$
2. $\frac{3}{8}$ and $\frac{1}{6}$	**5.** $\frac{9}{20}$ and $\frac{1}{4}$	**8.** $\frac{7}{12}$ and $\frac{7}{30}$
3. $1\frac{1}{12}$ and $\frac{1}{6}$	**6.** $\frac{5}{8}$ and $\frac{1}{6}$	**9.** $\frac{3}{8}$ and $\frac{1}{6}$

10–18. Find the differences in each example from 1 to 9.

Find the sum or the difference, as indicated in each case:

19. $\frac{3}{4} + \frac{1}{2}$ **23.** $\frac{3}{4} - \frac{5}{8}$ **27.** $\frac{3}{4} - \frac{3}{8}$ **31.** $\frac{3}{4} - \frac{5}{12}$

20. $\frac{2}{5} + \frac{3}{10}$ **24.** $\frac{7}{10} + \frac{1}{2}$ **28.** $\frac{2}{5} + \frac{7}{10}$ **32.** $\frac{5}{8} + \frac{3}{5}$

21. $\frac{1}{4} + \frac{2}{3}$ **25.** $\frac{4}{5} - \frac{1}{2}$ **29.** $\frac{5}{6} + \frac{3}{8}$ **33.** $\frac{5}{6} - \frac{3}{4}$

22. $\frac{3}{4} + \frac{3}{8}$ **26.** $\frac{4}{7} + \frac{4}{5}$ **30.** $\frac{1}{2} - \frac{1}{6}$ **34.** $\frac{1}{8} + \frac{2}{3}$

Add:

35. $18\frac{2}{3}$ **37.** $40\frac{3}{4}$ **39.** $68\frac{2}{3}$ **41.** $75\frac{5}{6}$

$\quad\ \ 21\frac{5}{6}$ $\quad\ \ 12\frac{1}{8}$ $\quad\ \ 46\frac{3}{4}$ $\quad\ \ 60\frac{2}{3}$

$\quad\ \ 14\frac{2}{9}$ $\quad\ \ 10\frac{1}{2}$ $\quad\ \ 34\frac{5}{8}$ $\quad\ \ 77\frac{5}{12}$

36. $45\frac{1}{2}$ **38.** $16\frac{3}{5}$ **40.** $77\frac{3}{10}$ **42.** $89\frac{1}{2}$

$\quad\ \ 48\frac{2}{3}$ $\quad\ \ 46\frac{5}{9}$ $\quad\ \ 65\frac{5}{8}$ $\quad\ \ 12\frac{5}{12}$

$\quad\ \ 57\frac{5}{6}$ $\quad\ \ 75\frac{5}{8}$ $\quad\ \ 40\frac{3}{4}$ $\quad\ \ 76\frac{1}{4}$

$\quad\ \ 62\frac{3}{4}$ $\quad\ \ 65\frac{3}{9}$ $\quad\ \ 97\frac{2}{3}$ $\quad\ \ 88\frac{5}{6}$

Subtract:

43. $24\frac{1}{2}$ **47.** $59\frac{5}{6}$ **51.** $25\frac{5}{8}$ **55.** $95\frac{3}{7}$ **59.** $87\frac{2}{3}$

$\quad\ \ 15\frac{3}{4}$ $\quad\ \ 35\frac{5}{12}$ $\quad\ \ 15\frac{1}{6}$ $\quad\ \ 39\frac{3}{4}$ $\quad\ \ 45\frac{5}{12}$

44. $97\frac{1}{6}$ **48.** $25\frac{1}{8}$ **52.** $56\frac{7}{8}$ **56.** $14\frac{1}{4}$ **60.** $78\frac{1}{8}$

$\quad\ \ 35\frac{1}{2}$ $\quad\ \ 10\frac{3}{4}$ $\quad\ \ 21\frac{3}{8}$ $\quad\ \ \ 9\frac{5}{8}$ $\quad\ \ 48\frac{1}{2}$

45. $58\frac{3}{4}$ **49.** $73\frac{1}{4}$ **53.** $61\frac{1}{3}$ **57.** $98\frac{3}{7}$ **61.** $99\frac{7}{10}$

$\quad\ \ 35\frac{11}{16}$ $\quad\ \ 13\frac{5}{6}$ $\quad\ \ 53\frac{3}{8}$ $\quad\ \ 87\frac{1}{4}$ $\quad\ \ 63\frac{5}{12}$

46. $109\frac{5}{6}$ **50.** $48\frac{2}{3}$ **54.** $68\frac{3}{4}$ **58.** $102\frac{1}{4}$ **62.** $220\frac{7}{20}$

$\quad\ \ 96\frac{5}{12}$ $\quad\ \ 25\frac{3}{4}$ $\quad\ \ 52\frac{3}{7}$ $\quad\ \ 87\frac{3}{5}$ $\quad\ \ 160\frac{5}{12}$

Give first the sum and then the difference of:

63. $\frac{3}{8}$ and $\frac{3}{10}$ **65.** $1\frac{3}{6}$ and $\frac{7}{12}$ **67.** $2\frac{1}{2}$ and $\frac{5}{12}$

64. $\frac{4}{9}$ and $\frac{3}{10}$ **66.** $\frac{7}{8}$ and $\frac{7}{16}$ **68.** $\frac{7}{8}$ and $\frac{3}{16}$

69. $\frac{3}{4}$ and $\frac{2}{3}$ **71.** $1\frac{5}{6}$ and $\frac{5}{12}$ **73.** $4\frac{1}{3}$ and $5\frac{1}{8}$

70. $\frac{9}{8}$ and $\frac{8}{9}$ **72.** $2\frac{5}{8}$ and $3\frac{1}{4}$ **74.** $\frac{6}{7}$ and $\frac{7}{8}$

Find the answers:

75. $2\frac{1}{2} + 4\frac{7}{8} - 3\frac{2}{3}$ **86.** $3\frac{9}{16} - \frac{3}{4} + 5\frac{5}{9}$

76. $5\frac{2}{3} - 1\frac{5}{8} + 4\frac{7}{12}$ **87.** $3\frac{11}{12} - 2\frac{7}{8} + 3\frac{5}{8}$

77. $5\frac{5}{6} + 2\frac{1}{2} - 5\frac{5}{16}$ **88.** $1\frac{9}{10} - \frac{3}{16} + \frac{7}{8}$

78. $7\frac{3}{4} + 2\frac{5}{16} - 7\frac{7}{8}$ **89.** $5\frac{1}{7} + 3\frac{11}{14} - 2\frac{1}{2}$

79. $10\frac{1}{10} + 3\frac{3}{4} - 4\frac{7}{12}$ **90.** $8\frac{3}{4} - 1\frac{9}{16} + 5\frac{7}{10}$

80. $5\frac{5}{8} - 4\frac{3}{4} + 7\frac{5}{8}$ **91.** $3\frac{5}{8} - \frac{11}{12} + 7\frac{2}{9}$

81. $6\frac{1}{8} + 4\frac{3}{8} - 1\frac{3}{16}$ **92.** $3\frac{5}{8} - \frac{7}{10} + 3\frac{3}{4}$

82. $8\frac{5}{8} + 2\frac{5}{16} - 7\frac{1}{8}$ **93.** $2\frac{1}{2} + 4\frac{7}{15} + 9\frac{7}{12}$

83. $3\frac{1}{8} + 5\frac{7}{8} - 6\frac{7}{10}$ **94.** $3\frac{9}{10} - \frac{11}{16} + 4\frac{5}{9}$

84. $2\frac{7}{12} + \frac{3}{10} - \frac{4}{5}$ **95.** $\frac{11}{12} + 3\frac{9}{10} - 3\frac{5}{8}$

85. $\frac{3}{4} + 2\frac{7}{8} - 3\frac{1}{12}$ **96.** $2\frac{5}{8} + \frac{3}{14} + 7\frac{7}{12}$

MULTIPLICATION OF FRACTIONS

Give the products:

1. $8 \times \frac{3}{5}$ **4.** $7 \times \frac{8}{9}$ **7.** $12 \times \frac{5}{16}$

2. $6 \times \frac{5}{7}$ **5.** $8 \times \frac{4}{7}$ **8.** $8 \times \frac{4}{15}$

3. $11 \times \frac{2}{9}$ **6.** $10 \times \frac{5}{11}$ **9.** $9 \times \frac{11}{14}$

Find:

10. $\frac{2}{3}$ of 8   **13.** $\frac{4}{5}$ of 14   **16.** $\frac{7}{9}$ of 18   **19.** $\frac{3}{16}$ of 23

11. $\frac{5}{6}$ of 7   **14.** $\frac{3}{4}$ of 15   **17.** $\frac{3}{11}$ of 12   **20.** $\frac{2}{15}$ of 11

12. $\frac{7}{8}$ of 19   **15.** $\frac{4}{5}$ of 16   **18.** $\frac{5}{12}$ of 11   **21.** $\frac{3}{20}$ of 17

Find:

22. $\frac{2}{3}$ of $\frac{5}{9}$ **25.** $\frac{3}{5}$ of $\frac{7}{8}$ **28.** $\frac{5}{12}$ of $\frac{5}{7}$ **31.** $\frac{2}{7}$ of $\frac{4}{15}$

23. $\frac{3}{4}$ of $\frac{7}{8}$ **26.** $\frac{7}{8}$ of $\frac{3}{4}$ **29.** $\frac{5}{16}$ of $\frac{5}{8}$ **32.** $\frac{7}{20}$ of $\frac{7}{8}$

24. $\frac{5}{6}$ of $\frac{11}{12}$ **27.** $\frac{8}{9}$ of $\frac{10}{11}$ **30.** $\frac{2}{15}$ of $\frac{4}{5}$ **33.** $\frac{3}{16}$ of $\frac{5}{7}$

1. Find $\frac{7}{8}$ of $\frac{8}{9}$.

(1) $\frac{7}{8}$ of $\frac{8}{9} = \frac{56}{72} = \frac{7}{9}$

(2) $\frac{7}{\cancel{8}} \times \frac{\cancel{8}}{9} = \frac{7}{9}$

In changing $\frac{56}{72}$ to $\frac{7}{9}$, both terms of the fraction are divided by 8. The work may be shortened by rejecting the factor 8 from both dividend and divisor, as indicated in the second model. This reduces the answer to **lowest terms** by taking out common factors before multiplying.

In the following operations, cancel whenever possible.

Multiply :

2. $16 \times \frac{3}{8}$	**7.** $12 \times \frac{1}{3}$	**12.** $\frac{8}{15}$ of 25	**17.** $\frac{3}{16}$ of 30
3. $24 \times \frac{7}{8}$	**8.** $13 \times \frac{19}{26}$	**13.** $\frac{7}{24}$ of 15	**18.** $\frac{5}{12}$ of 50
4. $27 \times \frac{2}{3}$	**9.** $14 \times \frac{11}{12}$	**14.** $\frac{12}{25}$ of 10	**19.** $\frac{7}{15}$ of 75
5. $45 \times \frac{4}{9}$	**10.** $12 \times \frac{16}{}$	**15.** $\frac{13}{14}$ of 28	**20.** $\frac{8}{11}$ of 66
6. $18 \times \frac{10}{3}$	**11.** $10 \times \frac{7}{20}$	**16.** $\frac{7}{9}$ of 81	**21.** $\frac{7}{16}$ of 64

Find :

22. $\frac{2}{3}$ of $\frac{3}{4}$	**27.** $\frac{2}{5}$ of $\frac{5}{6}$	**32.** $\frac{3}{4}$ of $\frac{4}{9}$
23. $\frac{2}{3}$ of $\frac{3}{10}$	**28.** $\frac{3}{8}$ of $1\frac{1}{4}$	**33.** $\frac{7}{12}$ of $1\frac{3}{18}$
24. $\frac{3}{4}$ of $\frac{6}{7}$	**29.** $\frac{5}{7}$ of $1\frac{4}{15}$	**34.** $\frac{9}{10}$ of $\frac{15}{16}$
25. $\frac{2}{5}$ of $1\frac{10}{11}$	**30.** $\frac{3}{8}$ of $\frac{3}{16}$	**35.** $\frac{5}{11}$ of $2\frac{2}{25}$
26. $\frac{4}{5}$ of $\frac{5}{8}$	**31.** $\frac{5}{6}$ of $1\frac{2}{13}$	**36.** $\frac{7}{11}$ of $2\frac{2}{25}$

Find :

37. $9 \times 2\frac{1}{4}$	**42.** $8\frac{1}{2} \times 7$	**47.** $27 \times 12\frac{5}{36}$
38. $12 \times 3\frac{2}{8}$	**43.** $2\frac{7}{15} \times 10$	**48.** $19 \times 8\frac{1}{3}$
39. $18 \times 5\frac{3}{8}$	**44.** $9\frac{5}{12} \times 16$	**49.** $26 \times 5\frac{7}{39}$
40. $22 \times 4\frac{3}{10}$	**45.** $8\frac{2}{7} \times 24$	**50.** $36 \times 7\frac{1}{4}$
41. $21 \times 2\frac{5}{14}$	**46.** $7\frac{13}{40} \times 32$	**51.** $42 \times 8\frac{1}{12}$

52. Find the product of $\frac{2}{3} \times 7\frac{1}{2} \times 3$.

$\frac{2}{3} \times 7\frac{1}{2} \times 3 =$ Reduce the mixed number to an improper

$\dfrac{\cancel{2}}{\cancel{3}} \times \dfrac{15}{\cancel{2}} \times \dfrac{\cancel{3}}{1} = 15$ fraction. Cancel first the factor 2 from divi-
dend and divisor; then the factor 3.
The product is $\frac{15}{1}$, or 15.

Find the products, canceling when possible :

53. $5\frac{2}{5} \times \frac{5}{6} \times \frac{1}{3}$ **63.** $5\frac{1}{4} \times \frac{3}{7} \times \frac{2}{5} \times \frac{5}{6}$

54. $3\frac{1}{3} \times \frac{4}{5} \times \frac{3}{4}$ **64.** $\frac{3}{10} \times \frac{5}{6} \times \frac{3}{4} \times \frac{8}{9}$

55. $7\frac{1}{5} \times \frac{4}{9} \times \frac{5}{7}$ **65.** $\frac{7}{10} \times 5\frac{1}{5} \times \frac{3}{10} \times \frac{1}{2}$

56. $5 \times \frac{5}{8} \times \frac{1}{6}$ **66.** $2\frac{7}{10} \times \frac{2}{5} \times \frac{5}{7} \times \frac{1}{2}$

57. $\frac{7}{8} \times 4 \times \frac{3}{7}$ **67.** $7\frac{1}{2} \times \frac{3}{5} \times \frac{3}{10}$

58. $4\frac{3}{4} \times \frac{3}{5} \times \frac{5}{6} \times \frac{1}{2}$ **68.** $3\frac{1}{5} \times \frac{3}{10} \times \frac{1}{2} \times 2\frac{2}{5}$

59. $4 \times \frac{3}{4} \times \frac{5}{7} \times \frac{1}{2}$ **69.** $2\frac{5}{16} \times \frac{3}{5} \times \frac{3}{16} \times 1\frac{1}{2}$

60. $\frac{5}{12} \times \frac{2}{3} \times 2\frac{1}{4} \times \frac{3}{8}$ **70.** $2\frac{2}{3} \times 4\frac{3}{4} \times \frac{2}{5} \times 1\frac{1}{4}$

61. $4\frac{2}{3} \times \frac{2}{7} \times \frac{3}{8} \times \frac{2}{3}$ **71.** $5\frac{1}{5} \times 4\frac{1}{4} \times 8\frac{1}{4} \times \frac{1}{2}$

62. $\frac{2}{9} \times \frac{3}{11} \times 7\frac{1}{3} \times \frac{1}{2}$ **72.** $1\frac{1}{5} \times \frac{3}{4} \times \frac{3}{8} \times 3\frac{3}{10}$

Find the answers in lowest terms :

73. $\frac{1}{4}$ of $\frac{3}{10}$ of $\frac{3}{4}$ **81.** $\frac{2}{3}$ of $\frac{1}{8}$ of $\frac{2}{5}$ **89.** $\frac{1}{2}$ of $\frac{1}{4}$ of $\frac{1}{8}$

74. $\frac{3}{4}$ of $\frac{5}{6}$ of $\frac{5}{8}$ **82.** $\frac{1}{2}$ of $\frac{1}{8}$ of $\frac{1}{10}$ **90.** $\frac{3}{8}$ of $\frac{3}{4}$ of $\frac{1}{4}$

75. $\frac{4}{5}$ of $\frac{3}{10}$ of $\frac{2}{3}$ **83.** $\frac{3}{10}$ of $\frac{3}{8}$ of $\frac{7}{10}$ **91.** $4\frac{1}{2} \times \frac{3}{4} \times 5\frac{1}{2}$

76. $\frac{1}{6}$ of $\frac{3}{8}$ of $\frac{1}{2}$ **84.** $\frac{3}{8}$ of $\frac{2}{9}$ of $\frac{4}{5}$ **92.** $4\frac{2}{3} \times \frac{1}{4} \times \frac{3}{10}$

77. $\frac{3}{4}$ of $3\frac{1}{3}$ of 4   **85.** $\frac{5}{6}$ of $2\frac{1}{3}$ of $\frac{1}{7}$ **93.** $4\frac{1}{5} \times 6\frac{1}{3} \times 5$

78. $\frac{2}{3}$ of $2\frac{1}{2}$ of 2   **86.** $\frac{4}{5}$ of $\frac{3}{4}$ of $\frac{5}{8}$ **94.** $25\frac{1}{2} \times 12\frac{1}{4} \times \frac{1}{7}$

79. $\frac{4}{5}$ of $\frac{5}{8}$ of $\frac{2}{3}$ **87.** $\frac{1}{3}$ of $\frac{3}{4}$ of $\frac{2}{3}$ **95.** $\frac{3}{4}$ of $4\frac{1}{2}$ of $\frac{2}{3}$

0. $\frac{5}{8}$ of $\frac{3}{10}$ of $\frac{1}{3}$ **88.** $\frac{1}{6}$ of $\frac{3}{8}$ of $\frac{3}{9}$ **96.** $\frac{9}{10}$ of $2\frac{1}{2}$ of $\frac{4}{5}$

Written Work

Find the quotients, canceling when possible:

1.	$4 \div \frac{1}{8}$	**21.**	$8\frac{2}{5} \div 4\frac{1}{4}$	**41.**	$77 \div 2\frac{1}{3}$
2.	$1\frac{1}{6} \div \frac{2}{3}$	**22.**	$1\frac{1}{4} \div \frac{5}{6}$	**42.**	$103 \div 10\frac{3}{10}$
3.	$5 \div \frac{3}{4}$	**23.**	$8 \div \frac{7}{8}$	**43.**	$10 \div \frac{2}{5}$
4.	$\frac{7}{8} \div \frac{2}{3}$	**24.**	$7 \div \frac{4}{5}$	**44.**	$1\frac{1}{4} \div \frac{1}{4}$
5.	$\frac{11}{15} \div \frac{7}{15}$	**25.**	$\frac{3}{4} \div \frac{7}{8}$	**45.**	$12 \div \frac{3}{7}$
6.	$\frac{5}{6} \div \frac{7}{8}$	**26.**	$\frac{5}{9} \div \frac{8}{10}$	**46.**	$1\frac{3}{8} \div \frac{3}{4}$
7.	$\frac{7}{12} \div \frac{5}{12}$	**27.**	$\frac{3}{7} \div \frac{5}{14}$	**47.**	$5\frac{1}{5} \div 2\frac{5}{6}$
8.	$\frac{15}{16} \div 8$	**28.**	$1\frac{3}{16} \div \frac{3}{4}$	**48.**	$3\frac{3}{4} \div 4$
9.	$\frac{6}{7} \div 5$	**29.**	$\frac{13}{20} \div 19$	**49.**	$5\frac{7}{8} \div 10$
10.	$\frac{11}{12} \div 6$	**30.**	$\frac{11}{14} \div 14$	**50.**	$3\frac{5}{6} \div 25$
11.	$\frac{21}{25} \div 7$	**31.**	$\frac{9}{11} \div 11$	**51.**	$9\frac{1}{3} \div 14$
12.	$\frac{15}{16} \div 10$	**32.**	$\frac{15}{16} \div 32$	**52.**	$\frac{3}{10} \div 27$
13.	$22\frac{3}{4} \div 13$	**33.**	$\frac{11}{14} \div 28$	**53.**	$\frac{13}{25} \div 15$
14.	$35\frac{1}{6} \div 16$	**34.**	$41\frac{7}{8} \div 22$	**54.**	$\frac{19}{25} \div 38$
15.	$17\frac{3}{8} \div 12$	**35.**	$37\frac{1}{8} \div 10$	**55.**	$51\frac{3}{7} \div 20$
16.	$2\frac{1}{2} \div 2\frac{1}{3}$	**36.**	$18\frac{1}{4} \div 32$	**56.**	$29\frac{2}{11} \div 9$
17.	$12\frac{1}{2} \div 16\frac{2}{3}$	**37.**	$18\frac{2}{7} \div 7\frac{1}{8}$	**57.**	$46\frac{2}{5} \div 15$
18	$8\frac{2}{3} \div 4\frac{3}{4}$	**38.**	$19\frac{3}{8} \div 1\frac{3}{5}$	**58.**	$67\frac{3}{16} \div 7\frac{3}{4}$
19.	$5\frac{1}{5} \div 4\frac{1}{4}$	**39.**	$160 \div \frac{5}{8}$	**59.**	$90\frac{3}{4} \div \frac{11}{12}$
20.	$7\frac{3}{8} \div 6\frac{1}{2}$	**40.**	$16\frac{3}{7} \div 6\frac{9}{11}$	**60.**	$30\frac{3}{16} \div 5\frac{3}{4}$

First interpret these problems; *second*, estimate the result; *third*, give the shortest method of solution.

1. When 2 lb. of butter cost 90¢, how much do 5 lb. cost?

> SOLUTION.   5 lb. cost $\frac{5}{2}$ of, or $2\frac{1}{2}$ times, the cost of 2 lb.
> $2\frac{1}{2} \times 90$¢ $= \$2.25$

2. When 5 tablets cost 50¢, how much do 10 tablets cost?

3 If 2 pairs of gloves cost $1.50, how much do 4 pairs cost? 8 pairs? 6 pairs?

4. When 2 pencils cost 5¢, how much do 10 pencils cost? 6 pencils? 12 pencils?

5. When 3 lb. of butter cost $1.20, how much do 6 lb. cost?

6. If 6 hats cost $9.00, how much do 12 hats cost? 24 hats?

7. A train runs 52 mi. in 2 hr.   How far does it run in 22 hr.? in 14 hr.? in 12 hr.?

8. If 4 sets of books cost $74, how much do 2 sets cost? 16 sets? 8 sets?

> SUGGESTION.   2 sets $= \frac{1}{2}$ of 4 sets; 16 sets $= \frac{16}{4}$ of 4 sets, or 4 × 4 sets.

9. When 2 cans of corn cost 25¢, how much do 10 cans cost? 14 cans? 20 cans?

10. When 2 bolts of ribbon cost 10¢, how many bolts can be bought for 25¢? for 45¢?

11. Edith knits 3 rows of a sock in 5 min. and there are 9 rows to an inch.   How long does it take her to knit 8 inches?

> SUGGESTION.   Since 9 rows $= 3 \times 3$ rows, how many minutes, or what part of an hour, does it take for 1 in.? for 8 in.?

12. If 5 hanks of wool can be bought for $4, how many can be bought for $8? for $12? for $18?

13. If 5 boxes of berries cost 35¢, how much do 15 boxes cost? 25 boxes? 9 boxes?

SUGGESTION. 9 boxes are 1 less than 10 boxes.

14. If 5 yd. of serge cost $6.50, how much do 9 yd. cost? 15 yd.? 20 yd.? 11 yd.?

15. $3\frac{1}{2}$ lb. beefsteak cost $1.54. At that rate find the cost of 28 lb.

SUGGESTION. $3\frac{1}{2}$ lb. = $\frac{7}{2}$ lb. 28 lb. = $\frac{56}{2}$ lb. $\frac{56}{2}$ = how many times $\frac{7}{2}$?

16. A plumber's wages for $3\frac{1}{2}$ hr. are $2.80. At that rate find his wages for 42 hr.

17. $\frac{1}{6}$ of a man's profits for a year is $219. Find his profits.

18. $\frac{3}{5}$ of a ton of coal cost $5.40. At that rate find the cost of 1 ton.

19. $1\frac{1}{4}$ lb. veal cost 40¢. At that rate find the cost of $12\frac{1}{2}$ lb.

SOLUTION. $1\frac{1}{4}$ lb. = $\frac{5}{4}$ lb.; $12\frac{1}{2}$ lb. = $\frac{50}{4}$ lb. $\frac{50}{5}$ = 10; 10 × 40¢ = $4.

20. $3\frac{1}{2}$ lb. raisins cost 49¢. Find the cost of 20 lb. at the same rate.

21. John's profits the first three months of the year are $300. Find his profits at that rate for $\frac{3}{4}$ of a year.

22. If 2 desks cost $15, how much do 8 desks cost? 10 desks? 12 desks?

23. When 3 yd. of ribbon can be bought for $1.50, how many yards can be bought for $4.50? $6? $12?

24. When 8 yd. of velvet cost $24, how much does $\frac{1}{4}$ yd. cost?

25. A man walked $11\frac{1}{4}$ mi. in 3 hr. At the same rate, how far would he walk in 6 hr.?

26. If 3 acres of land cost $250, how much will 12 acres cost?

27. If $1\frac{1}{2}$ acres yield 120 bu. of potatoes, how many bushels will 3 acres yield at the same rate?

28. At the rate of 40 ¢ a dozen, how much will 9 lemons cost? How much will $1\frac{1}{2}$ doz. cost? 3 doz.?

29. If 6 collars cost $2.10, how much will 24 cost?

30. Find the cost of the following articles : 12 yd. ribbon @ 25 ¢, 8 yd. lace @ $12\frac{1}{2}$ ¢, 10 yd. dimity @ 20 ¢.

Suggestion. $25¢ = \$\frac{1}{4}$; $12\frac{1}{2}¢ = \$\frac{1}{8}$; $20¢ = \$\frac{1}{5}$.

31. Find the cost of 6 lb. sugar @ $8\frac{1}{3}$ ¢, 3 lb. tea @ $33\frac{1}{3}$ ¢, and 8 lb. grapes @ $12\frac{1}{2}$ ¢.

32. How many pounds of coffee can be bought for $40 at 25 ¢ a pound?

Solution. $\$40 \div \$\frac{1}{4} = 160$, number of pounds.

33. How many yards of ribbon, at $12\frac{1}{2}$ ¢ a yard, can be bought for $2?

34. How many yards of silk, at $1.25 a yard, can be bought for $10?

Suggestion. $\$1.25 = \$\frac{5}{4}$; $\$10 \div \$\frac{5}{4} = ?$

35. How many yards of silk, @ 1.12\frac{1}{2}$, can be bought for $9?

Suggestion. $\$1.12\frac{1}{2} = \$\frac{9}{8}$.

36. Find the cost of $6\frac{1}{4}$ yd. of ribbon at 16 ¢ a yard.

Solution. $6\frac{1}{4}$ yd. $= \frac{1}{16}$ of 100 yd.; $100 \times \$.16 = \$16$; $\frac{1}{16}$ of $16 = \$1$.

37. Find the cost of $12\frac{1}{2}$ lb. of butter at 48 ¢ a pound.

Find the amount of the following bills:

38. 4 yd. lace @ $12\frac{1}{2}$ ¢.

39. $12\frac{1}{2}$ lb. sugar @ 8 ¢.

40. 16 yd. ribbon @ $12\frac{1}{2}$ ¢.

41. $6\frac{1}{4}$ lb. prunes @ 12 ¢.

42. 8 lb. butter @ 50 ¢.

43. 24 tickets @ 25 ¢.

Oral Work

1. How many dimes equal a dollar? Then what part of a dollar is a dime?

2. How many cents equal a dollar? Then what part of a dollar is a cent?

3. Ten mills equal one cent. How many mills equal a dollar? Then what part of a dollar is a mill?

Mills are not coined, but are used for exactness in computations.

When we think of a dollar as dimes, it has 10 equal parts; when we think of a dollar as cents, it has 100 equal parts; when we think of a dollar as mills, it has 1000 equal parts. A mill is $\frac{1}{10}$ of a cent; a cent $\frac{1}{10}$ of a dime ; and a dime $\frac{1}{10}$ of a dollar.

This division of the dollar into tenths, hundredths, thousandths, etc., we call **decimal parts of the dollar.**

The point separating dollars and cents is called the **decimal point.** Thus, in $ 2.75 the point separates 2 dollars from 75 cents.

4. What decimal part of a dollar are 5 dimes? 6 dimes? 8 dimes? 9 dimes?

5. What decimal part of a dollar are 5 cents? 8 cents? 9 cents? 10 cents?

The first place to the right of the decimal point is occupied by *dimes* or *tenths* of a dollar; the second place, by *cents* or *hundredths* of a dollar; the third place, by *mills* or *thousandths* of a dollar.

Dimes, cents, and mills can always be written as decimal parts of a dollar. Thus, 8 dimes, 5 cents = $.85 ; 2 mills = $.002.

One tenth may be written .1 as well as $\frac{1}{10}$; **one hundredth** may be written .01 as well as $\frac{1}{100}$; and **one thousandth** may be written .001 as well as $\frac{1}{1000}$.

1. Read: .8 ft., .5 lb., .7 pk., .5 ft., .7 mi.

A period placed before tenths is called a **decimal point.**

Any number of 10ths, 100ths, 1000ths, etc., of a unit is called a **decimal fraction.** When expressed after a decimal point and without a written denominator it is usually called a **decimal.**

The first place to the right of the decimal point is called **tenths;** the second place, **hundredths;** and the third place, **thousandths.**

2. In 5.55, the 5 hundredths is what part of the 5 tenths? the 5 tenths is what part of the 5 units?

3. Name the following parts of a dollar, first as tenths, hundredths, and thousandths; then as cents and mills: $.655, $.054, $.005, $.50, $.75, $.80, $.705, $.256.

4. Write in figures: six dollars and five cents; ten dollars and fifty cents; three mills; five cents; five mills.

5. Read; then change to cents. Thus, $3.85 = 385¢. $2.05; $.70; $0.07; $7.42; $8.00; $.75; $3.50.

6. Change to dollars and cents: 55¢; 85¢; 870¢; 1002¢.

7. Write: eighty-five cents; nine dollars and two cents; twenty-two dollars; nine hundred dollars and six cents.

8. Write: one dollar and one cent; 10 dollars and one cent; eighty-seven cents five mills.

In any number, whether a whole number or a decimal, *the value of a figure in any place is $\frac{1}{10}$ of the value of the same figure standing one place to the left.*

9. What is the largest decimal division of a unit? the second largest? the third largest?

10. $.06 = \frac{?}{100} = \frac{?}{1000}$

13. $.9 = \frac{?}{10} = \frac{?}{100} = \frac{?}{1000}$

11. $.25 = \frac{?}{100} = \frac{?}{1000}$

14. $.025 = \frac{?}{1000} = \frac{?}{10000}$

12. $.05 = \frac{?}{100} = \frac{?}{1000}$

15. $.349 = \frac{?}{1000} = \frac{?}{10000}$

Observe that a decimal is always less than a unit.

Hundreds	Tens	Ones	Dec. Point	Tenths	Hundredths	Thousandths
5	**2**	**5**	**.**	**2**	**5**	**6**

This number is read " five hundred twenty-five *and* two hundred fifty-six thousandths."

As the first decimal division of a unit is tenths, we always begin to enumerate the decimal at tenths' place; thus:

tenths	hundredths	thousandths
.0	0	5

16. Where do we begin to enumerate whole numbers?

17. Read : .25, .025, 25.005, 7.05, 321.1, 100.001, .001.

18. Write as decimals: $\frac{5}{10}$, $\frac{7}{100}$, $\frac{25}{1000}$, $\frac{1}{10}$, $\frac{15}{1000}$, $\frac{2}{1000}$, $26\frac{6}{1000}$, $100\frac{1}{1000}$, $1\frac{8}{10}$, $70\frac{105}{1000}$.

Write as decimals :

19. Two thousandths.

20. Two and two thousandths.

21. Five hundredths.

22. Two hundred and two thousandths.

23. Two hundred two thousandths.

24. Three and five tenths.

25. Seventy-five hundredths.

26. Five hundred and five thousandths.

How to change decimals to common fractions.

1. Change .5 to a common fraction. $.5 = \frac{5}{10} = \frac{1}{2}$.

2. Express as a common fraction, .25, .45, .025.

Written Work

1. Change .875 to a common fraction in its lowest terms.

$$.875 = \frac{875}{1000} = \frac{7}{8}$$

Expressed in the form of a common fraction .875 = $\frac{875}{1000}$. By dividing both the numerator and the denominator of $\frac{875}{1000}$ first by 25 and then by 5, we reduce it to its lowest terms, $\frac{7}{8}$.

To change a decimal to a common fraction, write the decimal, omitting the decimal point, place the decimal denominator beneath the numerator, and change the fraction to its lowest terms.

Change to common fractions in their lowest terms:

2. .15	**4.** .9	**6.** .75	**8.** .125
3. .825	**5.** .325	**7.** .025	**9.** .425

10. Memorize the following equivalents:

$\frac{1}{2} = .50$	$\frac{3}{4} = .75$	$\frac{4}{5} = .80$	$\frac{5}{8} = .62\frac{1}{2}$
$\frac{1}{3} = .33\frac{1}{3}$	$\frac{1}{5} = .20$	$\frac{1}{6} = .16\frac{2}{3}$	$\frac{7}{8} = .87\frac{1}{2}$
$\frac{2}{3} = .66\frac{2}{3}$	$\frac{2}{5} = .40$	$\frac{1}{8} = .12\frac{1}{2}$	$\frac{1}{12} = .08\frac{1}{3}$
$\frac{1}{4} = .25$	$\frac{3}{5} = .60$	$\frac{3}{8} = .37\frac{1}{2}$	$\frac{1}{16} = .06\frac{1}{4}$

11. Change to decimal tenths: $\frac{1}{5}, \frac{1}{2}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}$.

12. Change to decimal hundredths: $\frac{3}{4}, \frac{3}{8}, \frac{2}{3}, \frac{5}{8}, \frac{7}{8}, \frac{1}{16}, \frac{1}{12}$.

Change to common fractions in their lowest terms:

13. .45	**17.** .375	**21.** .725	**25.** .48
14. .625	**18.** .80	**22.** .90	**26.** .150
15. .85	**19.** .20	**23.** .96	**27.** .50
16. .65	**20.** .60	**24.** .40	**28.** .275

What kind of fractions can be added or subtracted?

In *adding* or *subtracting* decimals, like units must always be written under one another. Thus, to add .8, .85, and .096, write them as follows:

.8
.85
.096

Why must tenths be written *under* tenths, hundredths *under* hundredths, etc.?

A **mixed** decimal is a whole number and a decimal united. Thus, 4.05 is a mixed decimal.

Written Work

1. Add 45.5, 6.005, and 40.

45.5   Keep the decimal points in a column; also the units of the
6.005   same order. Add as in whole numbers, placing the decimal
40.   point in the sum under the points above.
—
91.505   Test by adding downwards.

Write from dictation. Then add and test:

2. .1 + .2 + .35 + .365 = ?   **6.** 3.04 + 4.05 + 6.099 = ?

3. .02 + .05 + .095 = ?   **7.** .007 + .009 + .0101 = ?

4. .05 + .007 + .089 = ?   **8.** 2.006 + 7.009 + 9.012 = ?

5. 1.2 + 3.4 + 4.5 = ?   **9.** .001 + .068 + .092 = ?

10. .5 + 2.5 + .003 + .60 = ?

11. .7 + 1.07 + 1.007 = ?

12. .07 + 5.081 + .001 + .90 = ?

13. .1 + 2 + .75 + 8.006 = ?

14. 3 + .7 + 5.02 + 7.008 = ?

15. 5 + 8 + .3 + .05 + .006 = ?

16. .9 + .81 + .72 + 1.075 + 17.85 = ?

17. .9 + .85 + .005 + .25 + .895 = ?

Write from dictation. Then add and test:

18.	1.45	20.	.424	22.	.7	24.	11.111
	3.7		8.2		.425		3.06
	10.01		6.16		18.54		.635
	2.005		19.009		7.011		.009
19.	18.002	21.	.040	23.	89.400	25.	.707
	2.056		48.010		75.800		101.101
	121.114		.708		761.612		96.086
	2.02		89.010		1245.000		27.409

26. Find the sum of 15.38, 9.17, 3.07, and 20.35.

27. What is the distance around a triangle whose sides are 4.75 in., 6.25 in., and 8.5 in.?

28. Helen paid $.25 for a handkerchief, $4.75 for a pair of shoes, $.45 for lace, and $3.49 for a waist. How much did they all cost?

29. A train ran the first hour 19.625 mi.; the second hour, 20.5 mi.; the third hour, 20.75 mi.; the fourth hour, 21.225 mi. How far did it run in the four hours?

30. What is the distance around a garden that is 35.25 ft. long and 21.5 ft. wide?

31. The distance from Trent to Houston is 4.31 mi., thence to Hastings 11.25 mi., thence to Newton 8.37 mi. How far is it from Trent to Newton?

32. Find the sum of 24.36, 108.075, 20.009, 200.001, 654.03, 549.5, and 721.25.

33. Esther canned 336.5 qt. of fruit, 285.75 qt. of vegetables, 24 qt. of soup, 31.25 qt. of meats, and 172.5 qt. of jellies. How many quarts did she can in all?

Oral Work

Perform the operations indicated:

1. .5 − .3 = ?   **5.** .008 − .002 = ?

2. .9 − .8 = ?   **6.** .014 − .011 = ?

3. 15.8 − 11.7 = ?   **7.** .08 + .09 − .12 + .04 + .02 = ?

4. 4.7 − 3.2 = ?   **8.** .009 + .003 − .007 − .004 = ?

Written Work

1. From 16.35 subtract 11.76.

16.35   Keep the decimal points in a column. Subtract as in whole
11.76   numbers, placing the decimal point in the difference under the
 4.59   points above.

Subtract :

2.	7.	**6.**	25.2	**10.**	144.001
	1.21		9.18		12.256
3.	16	**7.**	151.003	**11.**	300.
	3.046		78.076		261.385
4.	1.101	**8.**	954.1	**12.**	86.59
	.796		258.375		53.594
5.	265.36	**9.**	36.291	**13.**	728.3
	84.468		17.456		619.333

14. Warren had $7.50 and spent $3.75. How much had he remaining?

15. The distance between two towns is 9 mi. After I have walked 3.625 mi., how far have I yet to walk?

16. A man having 120 acres of land, first sold 28.75 acres, and then, 35.5 acres. How many acres had he left?

17. I paid $1.25 for car fare, $.65 for dinner, and $.90 for an umbrella. How much had I left from $5?

18. The second floor of a house was 18.78 ft. above the floor of the cellar, and the first floor was 7.92 ft. above it. How far was it from the first floor to the second?

19. Four lots measured in width 123.08 ft. Three of them were 25 ft., 32.72 ft., and 36.9 ft. wide. What was the width of the fourth lot?

20. A boy having $4.25 spent for skates $1.25, for a cap $.50, and for a hockey stick $.45. How much had he left?

21. The distance from A to E is 25.75 mi. From A to B it is 3.25 mi.; from B to C, 8.5 mi.; from C to D, 7.25 mi. What is the distance from D to E?

22. A farmer owned 18.125 acres of land. He sold 3.25 acres to his brother, 4.5 acres to his son, 2.75 acres to his cousin, and 2.5 acres to a neighbor. How many acres had he left?

23. A fisherman brought home four trout weighing 1.25 lb., .875 lb., 1.375 lb., and 1.125 lb. How much less than 5 lb. did they all weigh?

24. A farmer cut 40 tons of hay. He sold 6.85 tons to one man, and 5.50 tons to another. He fed the rest to his stock. How many tons did he feed to his stock?

25. From a heap of coal in a coal yard containing 75 tons, four truck loads were taken containing 4.75 tons, 3.5 tons, 2.25 tons, and 4.5 tons. How much remained in the heap?

26. A man having $20 spent $4.75 for board, $2.80 for a room, $.88 for laundry, $1.75 for a pair of gloves, and $3.50 for a pair of shoes. How much had he left?

27. A merchant purchased the following: coffee, $15.25; sugar, $18.35; cakes, $11.65; fruit, $27.75; and canned corn, $8.45. How much less than $120 was the amount of his bill?

How to multiply a decimal by an integer or an integer by a decimal.

Oral Work

1. How much is $5 \times .3$? $.3 \times 5$?

SOLUTION. $5 \times .3 = 5 \times \frac{3}{10} = \frac{15}{10} = 1.5.$
$.3 \times 5 = \frac{3}{10} \times 5 = \frac{15}{10} = 1.5.$

2. Find $4 \times .03$; $.03 \times 4$.

3. Find $6 \times .003$; $.003 \times 6$.

4. Find 6×1.3; 1.3×6.

SOLUTION. $6 \times 1.3 = 6 \times \frac{13}{10} = \frac{78}{10} = 7.8.$
$1.3 \times 6 = \frac{13}{10} \times 6 = \frac{78}{10} = 7.8.$

Notice that in each case when the multiplier is an integer, the product contains the same number of decimal places as the multiplicand; in each case when the multiplicand is an integer, the product contains the same number of places as the multiplier.

In multiplying a decimal by an integer, the product contains the same number of decimal places as the multiplicand.

In multiplying an integer by a decimal, the product contains the same number of decimal places as the multiplier.

Written Work

1. Multiply 5.75 by 6.

5.75
6
―――
34.50

6×5 hundredths $= 30$ hundredths, or 3 tenths and no hundredths. Write zero in hundredths' place and carry the three tenths.

6×7 tenths $= 42$ tenths; 42 tenths $+ 3$ tenths $= 45$ tenths, or 4 units and 5 tenths. Write 5 in tenths' place and carry the 4 units. Write the decimal point.

6×5 units $= 30$ units; 30 units $+ 4$ units $= 34$ units.

2. Multiply 575 by .026.

```
  575
  .026
 3 450
11 50
14.950
```
Multiply as in integers. As there are 3 decimal places in the multiplier, point off 3 places from the right in the product.

3. Multiply 623 by 1.35.

```
  623
  1.35
 31 15
.186 9
 623
841.05
```
As there are 2 decimal places in the multiplier, point off 2 places from the right in the product.

Find the products :

4.	8 × .015	**15.**	.9 × 117	**26.**	.066 × 3455
5.	9 × .005	**16.**	.02 × 112	**27.**	.467 × 2639
6.	18 × .17	**17.**	.64 × 236	**28.**	.095 × 7148
7.	25 × .207	**18.**	.004 × 149	**29.**	.081 × 3236
8.	44 × 5.6	**19.**	3.04 × 415	**30.**	234.17 × 1099
9.	65 × 7.5	**20.**	10.34 × 308	**31.**	4.022 × 1402
10.	73 × 8.4	**21.**	.005 × 718	**32.**	.05 × 2472
11.	117 × 9.3	**22.**	.024 × 122	**33.**	5.625 × 3122
12.	208 × 6.8	**23.**	.015 × 215	**34.**	.003 × 4144
13.	306 × 5.8	**24.**	.007 × 283	**35.**	1.02 × 596
14.	425 × 7.2	**25.**	2.042 × 212	**36.**	4.003 × 6407

37. How much do 7 arithmetics cost at $.82 apiece ?

38. How many feet are there in .375 mi.?

39. How many square inches are there in .75 sq. ft.?

40. At $.35 each, how much do 24 books cost?

41. A rod equals 16.5 ft.   How many feet equal 29 rd.?

42. At a Fresh Air Home it costs $.933 for a week for each child.   How much money must a man contribute if he wishes to give a two weeks' outing to each of 25 poor children?

43. When 1 lb. of cream cheese costs $.355, how much do 64 lb. cost?

44. How many pounds are there in .875 ton?

45. An automobile averages 17.75 mi. an hour.   How far does it travel in 14 hr.?

46. Multiply by 10: .6, .8, .84, .86, .76, .65, .54, .005.

47. Multiply 500 by: .06, .04, .005, .42, .47, 56.7, .478.

48. Multiply by 100: .6, .8, .84, .95, .86, .76, .06, .04, .005, 4.23, 56.7, .478, 8.6, 9.8, .594, 5.94, 59.4.

Find the cost of:

49. 24 lb. @ $.125
50. 27 yd. @ $.165
51. 56 bu. @ $.375
52. .875 ft. @ $4
53. .375 yd. @ $2
54. .125 T. @ $4

55. 64 bbl. @ $7.50
56. 16 ft. @ $18.75
57. 45 lb. @ $.052
58. 66 gal. @ $.75
59. 2 bu. @ $.375
60. 1.25 doz. @ $125

61. A girl sends 27 pieces to a laundry that charges her $.75 a dozen for washing and ironing them.   What is her bill?

62. If the rainfall in a certain state averages 4.62 in. a month, how much is the rainfall for the year?

63. A 24-story city building averages 14.75 ft. to a story. How high is the building?

How to divide by an integer.

Written Work

1. Divide .84 by 4 in this way :

$$4).84 \over .21$$

2. Divide 6.648 by 6 in this way :

$$6)6.648 \over 1.108$$

3. Divide 24.600 by 8 in this way :

$$8)24.600 \over 3.075$$

Observe that in dividing a decimal or a mixed decimal by an integer, the dividend is simply separated or *partitioned* into equal parts. Thus, $6.9 \div 3 = \frac{1}{3}$ of 6.9, or 2.3.

Divide and test, placing a decimal point in the quotient before beginning to divide :

4. 6).66   7. 7).714   10. 7)7.847

5. 3).96   8. 5).535   11. 6)6.936

6. 8).808   9. 4).848   12. 8)8.896

13. Explain why adding *zeros* to the right of a decimal does not change its value. Thus, .8 = .80, .05 = .050.

It is sometimes necessary to add zeros to the right of the dividend to complete the division.

14. Divide .12 by 5.   5).12 = 5).120
                                              .024

15. Divide 39.25 by 25.   16. Divide 12.648 by 24.

$$
\begin{array}{r}
1.57 \\
25)\overline{39.25} \\
25 \\
\hline
142 \\
125 \\
\hline
175 \\
175 \\
\hline
\end{array}
\qquad
\begin{array}{r}
.527 \\
24)\overline{12.648} \\
12\ 0 \\
\hline
64 \\
48 \\
\hline
168 \\
168 \\
\hline
\end{array}
$$

Ex. 15. How many times is 25 contained in 39? in 14.2? in 1.75?

Divide as in the division of integers, placing the decimal point in the quotient *directly above* the point in the dividend.

Ex. 16. Since 24 is larger than 12.648, the quotient must be a decimal.

17. Divide .1275 by 25.

```
     .0051
25).1275
     125
      25
      25
```

18. Divide 192.96 by 16.

```
       12.06
16)192.96
    16
    32
    32
     96
     96
```

In Ex. 17, two zeros must follow the decimal point in the quotient, since 25 is not contained in 1 or in 12.

In Ex. 18, one zero must follow the decimal point, since 16 is not contained in the third partial dividend, 9.

Place a decimal point directly above or below the decimal point in the dividend, before beginning to divide; then divide as in the division of integers.

Find the quotients and test:

19.	$69.92 \div 23$	**37.**	$283.88 \div 47$	**55.**	$.018 \div 12$
20.	$29.54 \div 14$	**38.**	$6.497 \div 73$	**56.**	$.546 \div 21$
21.	$195.2 \div 32$	**39.**	$16.150 \div 34$	**57.**	$.003 \div 10$
22.	$401.4 \div 18$	**40.**	$55.660 \div 92$	**58.**	$.368 \div 16$
23.	$3.434 \div 34$	**41.**	$5.460 \div 84$	**59.**	$1.625 \div 25$
24.	$156.4 \div 46$	**42.**	$16.272 \div 18$	**60.**	$24.36 \div 12$
25.	$1.014 \div 26$	**43.**	$1.25 \div 5$	**61.**	$172.8 \div 24$
26.	$5.084 \div 41$	**44.**	$.64 \div 16$	**62.**	$14.76 \div 41$
27.	$.945 \div 35$	**45.**	$.02 \div 40$	**63.**	$1.105 \div 65$
28.	$60.32 \div 52$	**46.**	$7.5 \div 60$	**64.**	$2.07 \div 46$
29.	$.968 \div 44$	**47.**	$4.9 \div 140$	**65.**	$31.2 \div 36$
30.	$.828 \div 23$	**48.**	$.01 \div 100$	**66.**	$2.31 \div 55$
31.	$5.18 \div 37$	**49.**	$.05 \div 500$	**67.**	$1.17 \div 65$
32.	$8.33 \div 49$	**50.**	$.03 \div 100$	**68.**	$16.5 \div 22$
33.	$1.566 \div 54$	**51.**	$.027 \div 18$	**69.**	$273.35 \div 35$
34.	$2.144 \div 67$	**52.**	$4.44 \div 50$	**70.**	$31.288 \div 48$
35.	$8.437 \div 59$	**53.**	$125 \div 50$	**71.**	$137.95 \div 31$
36.	$233.32 \div 38$	**54.**	$9.66 \div 46$	**72.**	$106.32 \div 24$

Find the quotients and test:

73. $4)\overline{.3}$ **74.** $8)\overline{.6}$ **75.** $6)\overline{6.27}$ **76.** $5)\overline{5.28}$

77. $1.6 \div 2$ **85.** $1.024 \div 6$ **93.** $3.108 \div 3$

78. $.9 \div 3$ **86.** $.102 \div 3$ **94.** $.08 \div 2$

79. $.12 \div 6$ **87.** $.039 \div 13$ **95.** $1.125 \div 5$

80. $.005 \div 5$ **88.** $1.44 \div 12$ **96.** $4.16 \div 4$

81. $.008 \div 4$ **89.** $3.015 \div 3$ **97.** $.35 \div 7$

82. $2.7 \div 9$ **90.** $.063 \div 7$ **98.** $.077 \div 11$

83. $1.2 \div 4$ **91.** $9.04 \div 8$ **99.** $.022 \div 2$

84. $.24 \div 8$ **92.** $.72 \div 10$ **100.** $.036 \div 6$

101. A piece of ground containing 1.565 A. was divided into 4 lots. How much ground was there in each lot?

102. A piece of property was sold for $1565.76. It belonged in equal shares to 3 sisters. How much did each receive?

103. 4.9 mi. of graded road were built in Mercer County this year. Mr. Ames had a contract for $\frac{1}{4}$ of the distance. Find the distance Mr. Ames built.

104. Four boys raised 1032.64 bu. of corn in one season. What was the average for each boy?

In Exs. 105–109, find results to mills.

105. It cost $18.56 to produce 124 bu. of corn. Find the average cost per bushel.

106. A crop of 6000 lb. of onions was raised at a cost of $24.45. Find the average cost per pound.

107. It cost $4.63 to raise 1077 lb. of tomatoes. What was the average cost per pound?

108. If 294 qt. of vegetables were canned at a cost of $13.65, what was the cost per quart?

109. When 207 bu. of potatoes were raised at a cost of $44.20, what was the cost per bushel?

How to change common fractions to decimals.

Oral Work

1. Change $\frac{1}{5}$ to tenths and express the result as a decimal. Thus, $\frac{1}{5} = \frac{2}{10}$, or .2.

2. Change $\frac{1}{2}$ to tenths ; to hundredths.

3. Change $\frac{1}{4}$ to hundredths.

4. Change $\frac{1}{8}$ to thousandths.

Written Work

1. Divide 12 by 16.

12 ÷ 16 = 12.00 ÷ 16.

$$\begin{array}{r} .75 \\ 16)\overline{12.00} \\ 11\ 2 \\ \hline 80 \\ 80 \\ \hline \end{array}$$

12 is equal to 12.00, which divided by 16 equals .75.

A decimal point must be placed after an integer before zeros are annexed.

Find the quotients:

2. 20 ÷ 75	**6.** 44 ÷ 99	**10.** 605 by 1210
3. 60 ÷ 150	**7.** 110 ÷ 220	**11.** 513 by 2052
4. 24 ÷ 228	**8.** 340 ÷ 1700	**12.** 208 by 1664
5. 30 ÷ 375	**9.** 510 ÷ 1020	**13.** 944 by 1888

14. Change $\frac{3}{4}$ to a decimal.

$$\frac{3}{4} = 3 \div 4 = 4)\overline{3.00}\ \ .75$$

Since a fraction may be regarded as an expression of division (p. 321), $\frac{3}{4} = 3 \div 4$. Annex zeros and divide as above. The result is .75.

Test. $.75 = \frac{75}{100}$, or $\frac{3}{4}$.

Change to decimals :

15. $\frac{1}{5}$	**17.** $\frac{2}{5}$	**19.** $\frac{7}{9}$	**21.** $\frac{1}{16}$
16. $\frac{3}{8}$	**18.** $\frac{5}{8}$	**20.** $\frac{3}{5}$	**22.** $\frac{5}{16}$

23. Change $\frac{4}{9}$ to a decimal.

9)4.000
.444$\frac{4}{9}$

In changing $\frac{4}{9}$ to a decimal it is evident that the divisor is not contained in the dividend without a remainder. The quotient may be indicated with a fraction, or a + sign may take the place of the fraction to show an undivided remainder.

9)4.000
.444+.

A common fraction is changed to an equivalent decimal by placing a decimal point after ones' place in the numerator and dividing by the denominator.

Change to decimals, and test:

1. $\frac{1}{3}$	6. $\frac{5}{12}$	11. $\frac{9}{16}$	16. $\frac{11}{12}$
2. $\frac{1}{6}$	7. $\frac{3}{7}$	12. $\frac{11}{16}$	17. $\frac{11}{15}$
3. $\frac{1}{12}$	8. $\frac{1}{9}$	13. $\frac{13}{25}$	18. $\frac{6}{7}$
4. $\frac{2}{3}$	9. $\frac{7}{12}$	14. $\frac{11}{20}$	19. $\frac{5}{9}$
5. $\frac{1}{7}$	10. $\frac{5}{7}$	15. $\frac{5}{11}$	20. $\frac{5}{6}$

Write as mixed decimals:

21. $5\frac{1}{4}$	31. $3\frac{3}{4}$	41. $2\frac{3}{20}$	51. $8\frac{1}{3}$
22. $4\frac{1}{2}$	32. $2\frac{7}{8}$	42. $2\frac{5}{7}$	52. $12\frac{1}{2}$
23. $3\frac{1}{8}$	33. $2\frac{1}{7}$	43. $2\frac{1}{12}$	53. $33\frac{1}{3}$
24. $8\frac{1}{5}$	34. $3\frac{2}{5}$	44. $1\frac{7}{20}$	54. $37\frac{1}{2}$
25. $3\frac{2}{3}$	35. $8\frac{1}{9}$	45. $8\frac{3}{16}$	55. $16\frac{2}{3}$
26. $7\frac{1}{4}$	36. $2\frac{4}{5}$	46. $6\frac{2}{9}$	56. $62\frac{1}{2}$
27. $8\frac{1}{10}$	37. $2\frac{3}{7}$	47. $9\frac{5}{12}$	57. $87\frac{1}{2}$
28. $6\frac{1}{6}$	38. $1\frac{3}{8}$	48. $4\frac{5}{16}$	58. $31\frac{1}{4}$
29. $3\frac{2}{5}$	39. $1\frac{5}{8}$	49. $3\frac{7}{12}$	59. $66\frac{2}{3}$
30. $5\frac{7}{8}$	40. $7\frac{5}{6}$	50. $6\frac{7}{16}$	60. $83\frac{1}{3}$

Oral Work

1. Observe your foot ruler. Notice that it is first divided into inches; then into $\frac{1}{2}$ inches; then into $\frac{1}{4}$ inches, $\frac{1}{8}$ inches, and $\frac{1}{16}$ inches. These are all the divisions of the inch that are used in ordinary business.

2. Measure the lengths and the widths of your various books to the nearest eighth of an inch.

3. Measure various objects in the schoolroom and express their lengths and widths in feet and fractions of a foot.

4. Observe the yardstick. Notice that it is divided in the same manner as the foot ruler. How many feet equal 1 yard? 1 foot is what part of a yard? 2 feet are what part of 1 yard?

5. How many feet equal a rod? Measure a rod on the blackboard with a yardstick. How many rods equal a mile?

6. Measure the length and the width of a playground in yards. Determine the length and the width of the playground in rods in two different ways.

7. How many rods equal 1½ mi.?

8. Secure a board 1 rd. in length and divide it into feet and fractions of a foot. With this board, measure 20 rd. from the schoolhouse and set a post.

NOTE. Pace off certain distances until you gain accuracy in estimating the length of your own steps. Secure a 50-foot tapeline and measure or estimate the distance you live from the schoolhouse.

In the city measure certain city blocks in both yards and rods. Estimate by distance between the hands — 1 ft., 1 yd., ½ yd., 1 in.

9. Estimate the length of a vacant lot in feet; then measure the length and compare the result with your estimate.

10. Show that 320 rd. = 5280 ft.; that 1760 yd. = 5280 ft.

11. Then estimate by pacing the number of feet in a street.

12. Paul steps 2 ft. 3 in. at a step. How many feet does he travel in 240 steps?

13. Mary steps 2 ft. 2 in. at a step. How far does she live from the schoolhouse if she paces the distance in 596 steps?

14. How many feet of fence are required for a garden in the form of an oblong 26 yd. long and 12 yd. wide?

15. James lives 180 rd. from the schoolhouse. How many feet does he travel in going to and coming from school?

16. If the walk to the mineral spring is ¼ mi., how many trips each day must I make to equal 4 mi.?

1. This oblong represents a room 30 ft. wide and 40 ft. long, drawn on a scale of 40 ft. to 1 in.   That is, the length of the room, 40 ft., is represented by 1 in. on the drawing and the width of the room, 30 ft., is represented by $\frac{3}{4}$ in. on the drawing.   Represent the same room on a scale of 10 ft. to 1 in. ; of 20 ft. to 1 in.

30 ft.
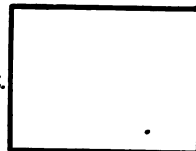
40 ft.

SCALE 40 ft. to 1 in.

2. Mary lives 50 rd. from school. Draw a line to represent this distance, on a scale of 10 rd. to 1 in.

3. The following lines are drawn on a scale of 10 ft. to 1 in.   Measure the lines and find the distances represented.

a. ————————————————————————————

b. ——————————————————————————

c. ————————————————————————

d. ———————————————————

e. ———————————————

4. An oblong measures $3\frac{1}{2}$ in. by $4\frac{1}{2}$ in.   If the scale is 10 ft. to 1 in., what is its width and its length ?

On the scale indicated by the heading, find what lengths or distances are represented by the following.

10 ft. to 1 in.	10 yd. to 1 in.	10 rd. to 1 in.	10 mi. to 1 in.
5. 4 in.	**8.** 3 in.	**11.** 1 in.	**14.** $1\frac{1}{2}$ in.
6. $5\frac{3}{4}$ in.	**9.** 4 in.	**12.** $1\frac{1}{2}$ in.	**15.** $2\frac{3}{4}$ in.
7. $2\frac{3}{4}$ in.	**10.** $4\frac{1}{2}$ in.	**13.** $2\frac{1}{2}$ in.	**16.** $3\frac{1}{4}$ in.

Draw oblongs on a suitable scale to represent :

17. 6 ft. by 9 ft.	**20.** 75 rd. by 120 rd.
18. 20 ft. by 30 ft.	**21.** 35 yd. by 55 yd.
19. 40 rd. by 80 rd.	**22.** 65 yd. by 95 yd.

23. Mary lives 15 mi. from Newark, and Susan lives 10 mi. from the same city. Draw a diagram or **graph** to represent these distances on a scale of 5 mi. to 1 in.

```
Newark                                          Mary
0                                                15
Newark                            Susan
0                                   10
```
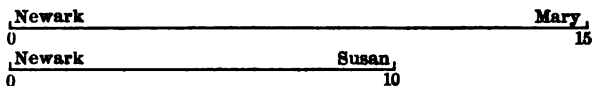
24. Henry, Frank, Martha, and Julia received the following averages for the school term : 96, 84, 90, 78. Represent their averages by lines in which 1 in. stands for 24.

25. Four boys put in the school savings bank, in one year, the following amounts : John, $48 ; Henry, $40 ; Edward, $60 ; and Paul, $50. Represent their savings by lines in which 1 in. stands for $24.

26. Find the scale of the map of the United States in the geography you are using, and test it by actual measurement to see whether it is correct ; also the map of your state.

27. Measure your school ground and draw a map of the surface on a suitable scale.

28. Draw, on a suitable scale, a map of your schoolroom floor, also a map of a blackboard.

29. Mr. Ronald's farm is 40 rd. by 80 rd. Show the surface on a scale of 20 rd. to 1 in.

30. The scale is frequently in fractions of an inch or of a foot. Draw a line, on a scale of 20 mi. to $\frac{1}{16}$ in., to show a distance of 3200 mi., which is about as far as from New York to San Francisco.

31. Mr. and Mrs. Jones and their three children, Mary, Martha, and Jane, are respectively 50, 40, 20, 15, and 10 yr. of age. Draw a graph to show a comparison of their ᵃs, on a suitable scale.

32. The maximum temperatures in a city for one week were 80, 75, 85, 70, 65, 90, and 70 degrees. Represent these temperatures by a graph, in which 1 in. stands for 20 degrees.

33. Five children attend the school term 180, 160, 170, 120, and 160 days respectively. Show their attendance by a graph in which 1 in. stands for 40 days.

34. Four children have put in the school savings bank $40, $48, $30, and $20. Show a comparison of their savings by a graph in which 1 in. stands for $8.

35. The lines below are drawn on a scale of 10 mi. to 1 in. How many miles does *AB* represent? *CD? EF? GH?*

A————————————————————————————B

C————————————————————D

E————————————————————————F

G——————————H

36. The following plan is $1\frac{1}{2}$ in. by $2\frac{7}{8}$ in. Find from the scale the actual width and length of the room. Find the actual width and length of each pupil's desk ($\frac{3}{16}$ in. by $\frac{1}{8}$ in.) and of the teacher's desk ($\frac{5}{16}$ in. by $\frac{1}{8}$ in.).
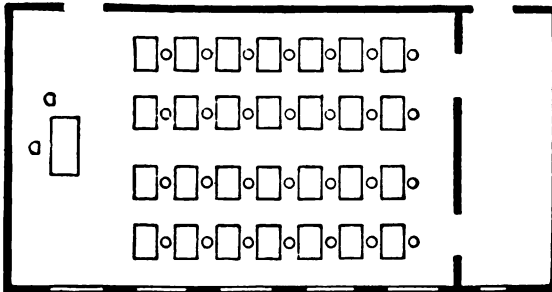
SCHOOLROOM: SCALE 16 FEET TO 1 INCH

37. Show graphically, on a suitable scale, a comparison of the length, the height, and the width of your schoolroom.

A **bill** is a statement of the amount owed for goods or services.

Observe that the following bill shows: (1) the *place* and the *date;* (2) who *bought* the goods; (3) who *sold* them; (4) the *name of the goods* sold and the *price* and the *amount* of each sale.

CHICAGO, ILL., *Dec.* 2, 1919.								
Mr. L. M. Thomas,								
320 State Street								
Bought of C. H. MORSE AND COMPANY								
TERMS: *Cash.*								
Dec.	*2*	*2 bu. apples*	@	*$2.00*	*4*	*00*		
		3 doz. eggs	@	*.45*	*1*	*35*		
		2 bbl. flour	@	*11.00*	*22*	*00*		
							27	*35*
		Paid						
		Dec. 2, 1919						
		C. H. Morse and Company						

To **foot** a bill means to add the cost of all the separate articles.

A bill is **receipted** when the person to whom the amount is due writes near the bottom " Paid " or " Received payment," followed by his name.

Make bills for the following sales, using a schoolmate's name as purchaser, and your grocer's name as seller of the goods:

1. March 1,   2 lb. nut butter @ 35 ¢.
  March 10,   6 lb. fish @ 25 ¢.
  March 10,   3 bars soap @ 10 ¢.

Make out and receipt bills as suggested on page 352:

2. Jan.   10,   3 skeins yarn @ $.08.
Jan.   10,   4 papers needles @ $.05.
Jan.   10,   5 yd. ribbon @ $.50.

3. Jan.   5,   5 bu. apples @ $1.75.
Jan.   10,   3 baskets peaches @ $1.50.
Jan.   15,   12 doz. lemons @ $.40.

4. March 1,   4 spools thread @ $.05.
March 11,   6 papers pins @ $.10.
March 25,   5 cards hooks and eyes @ $.02.

5. Feb.   11,   5 lb. beans @ $.15.
Feb.   11,   3 lb. prunes @ $.15.
Feb.   11,   4 lb. fish @ $. 24.

6. May   2,   7 silver forks @ $2.00.
May   6,   3 sterling spoons @ $1.75.
May   6,   4 napkin rings @ $3.25.

7. June   5,   4 nickel sponge racks @ $2.25.
June   6,   5 hairbrushes @ $2.00.
June   7,   6 nickel towel rods @ $.75.

8. June   6,   4 doz. pencils @ $.20.
June 11,   4 doz. penholders @ $.15.
June 15,   15 pens @ $.05.

9. June 17,   5 lb. knitting wool @ $3.20.
June 18,   1 knitting bag @ $1.50.
June 19,   4 knitting needles @ $.10.

10. July   8,   12 packages flaxseed @ $.05.
July   8,   3 oz. cologne @ $.35.
July   8,   5 lb. paint @ $.30.

11. July 15,   2 music cabinets @ $15.00.

     July 16,   5 rocking chairs @ $5.00.

     July 24,   3 medicine cabinets @ $3.00.

Suppose your classmates to own different stores, as, *meat shops, grocery stores, hardware stores, dry goods stores,* etc., and pretend that you are the customer. Make out proper bills for the following purchases, giving day and date of purchase. Receipt the bills.

12. September 10, 1 doz. oranges @ 40 ¢; 3 doz. bananas @ 20 ¢. September 14, 4 baskets grapes at 2 for 35 ¢. September 20, 6 qt. peanuts at 5 ¢ a pint.

13. October 4, 4 collars @ 12½ ¢; 1 necktie @ 50 ¢; 1 pair gloves @ $1.75; 1 cap @ $1.00; 1 shirt @ $1.50; 3 handkerchiefs @ 20 ¢.

14. September 10, 1 set of 6 chairs @ $13.00; 1 rocker @ $8.50. September 14, 1 bedroom suite @ $30.00; 1 mattress @ $6.00; 1 spring @ $4.50.

15. April 1, 2 hoes @ 80 ¢; 1 rake @ 60 ¢; 1 shovel @ $1.50. April 10, to repairing hose $1.90. This bill was paid May 1.

16. February 11, 3 lb. meat @ 38 ¢; 1 lb. fish @ 24 ¢. February 12, 4 lb. beans @ 15 ¢; 2 lb. country sausage @ 22 ¢. February 17, 3 lb. veal cutlets @ 30 ¢. Receipt this bill if paid February 21.

17. February 19, 1 chisel @ 40 ¢; 1 handsaw @ $1.10; 5 lb. nails @ 10 ¢. February 25, 3 boxes tacks @ 10 ¢; 1 shovel @ 80 ¢. Receipt this bill if paid March 1.

18. July 1, 1 fishing tackle @ $1.90; 1 doz. hooks @ 25 ¢; 6 fishlines @ $1.50; 1 tent @ $10; 2 skillets @ 40 ¢. Make out the bill if paid August 1.

19. August 1, 6 yd. of gingham @ 30 ¢; 2 yd. of ribbon @ 20 ¢; 1 doz. buttons @ 30 ¢; 2 spools of silk @ 12 ¢; 4 yd. of lace @ 6 ¢. Make out the bill if paid September 1.

Daily Marketing

Mr. Adams posted the following prices in his store window Saturday morning :

Canned peas, 2 for . . . . . $ .25	Green corn, per dozen . . $ .30
Tomatoes, per pound 12	Baked beans, per dozen cans 1.50
Beans, per pound 15	Eggs, per dozen 50
Butter, per pound 45	Eggplants, per dozen 75
Nut butter, per pound 35	Leg of lamb, per pound . . .46
Sugar, per 25 lb. bag . . . 2.00	Ham, per pound 45
Flour, per bag 1.75	Chickens, per pound 40

Find the cost of :

1. 7 lb. beans.
2. 15 lb. butter.
3. 30 doz. eggs.
4. $4\frac{1}{2}$ lb. chicken.
5. 12 lb. butter.
6. 2 doz. cans of peas.
7. $8\frac{1}{4}$ doz. corn.
8. 8 lb. tomatoes.
9. $2\frac{1}{2}$ bags flour.
10. 2 doz. cans baked beans.

11. 7 doz. eggplants.
12. 6 lb. lamb.
13. $2\frac{1}{3}$ doz. eggplants.
14. $2\frac{1}{4}$ lb. butter.
15. $1\frac{1}{2}$ lb. nut butter.
16. 8 lb. ham.
17. $1\frac{2}{3}$ doz. eggplants.
18. 3 bags sugar.
19. 9 doz. eggs.
20. $\frac{1}{2}$ doz. cans of peas.

21. Make out a receipted bill for the last five articles.

At the Fruit Store

Fruit dealers on Tuesday sell at the following prices:

Grapefruits, fancy, 2 for . .	$.25	Peaches, per bushel . . .	$2.00
Grapefruits, good, 3 for . .	.25	Peaches, per peck . . .	.60
Grapefruits, fair, 4 for . .	.25	Pears, per bushel	1.75
Blackberries, per crate . .	2.10	Apples, per bushel . . .	2.00
Blackberries, per basket . .	.10	Apples, per peck	.60
Raspberries, per crate . . .	3.20	Oranges, per dozen . . .	.45
Raspberries, per basket . .	.15	Bananas, per dozen . . .	.25
Cranberries, per bushel . .	3.80	Cranberries, per quart . .	.12½
Plums, 3 for	.05	Lemons, 2 for	.05

Using this market report, find the cost of :

1. 4 crates blackberries.
2. 1¼ bu. peaches.
3. 27 baskets raspberries.
4. 3 pk. pears.
5. 6 bu. apples.
6. 8 fair grapefruits.
7. 6 fancy grapefruits.
8. 3 good grapefruits.
9. 2¾ doz. oranges.
10. 2½ doz. bananas.
11. 1¾ bu. pears.
12. 1½ bu. apples.
13. 49 baskets blackberries.
14. 3 bu. apples.
15. 7¾ doz. oranges.
16. 84 doz. bananas.
     28 qt. cranberries.

18. 1 bu. 3 pk. cranberries.
19. 3¾ bu. apples.
20. 3 pk. peaches.
21. 15 plums.
22. 7¾ doz. bananas.
23. 17 baskets raspberries.
24. 1 doz. lemons.
25. 3½ bu. pears.
26. 3 pk. apples.
27. 10 fancy grapefruits.
28. 12 fair grapefruits.
29. 9 crates raspberries.
30. 12 crates blackberries.
31. 17 baskets blackberries.
32. 11 qt. cranberries.
33. 2 bu. pears.
34. 4¼ bu. pears.

Make problems suggested by your own experiences, as indicated by the following directions:

1. If you live in a city or a town, make two problems about purchases for yourselves or your parents; two about the amount you earn or save from your allowances; and two about prices of common articles at the local stores.

2. If you live in the country, make two problems about selling vegetables, fruits, grains, etc., at near-by towns; two about purchases for your home; and two about your earnings at various employments.

3. If you keep an account in a school savings bank, make problems relating to your experiences in depositing money.

4. Plan a vacation spent in visiting a friend or in making a trip. Frame problems to include the cost of traveling, purchases made on the trip, money spent for sight seeing, etc.

5. In solving problems, consider:

(a) What facts are stated in the problem.
(b) What kind of answer the question asks for.
(c) What steps are necessary, by the shortest method, to get the required answer from the given facts.
(d) What tests are necessary to give confidence in the accuracy of the answer.

As an aid to *accuracy*, make a *mental estimate* of the answer and compare it with the answer to your written work. If there is much difference between the two answers, you have made an error either in the estimate or in the written work. Also form the habit of *testing* all your work by *checking* the various processes.

As an aid to *rapidity*, recall all the short methods you have learned and think of others, if possible. When the opportunity occurs, make use of the facts learned on pages 303 and 334, as well as of cancellation:

To multiply by 10, 100, 1000, etc., annex to a whole number as many zeros as there are in the multiplier; in a decimal move the decimal point to the right as many places as there are zeros in the multiplier.

To divide by 10, 100, 1000, etc., cut off the zeros or move the decimal point to the left.

To multiply by 9, multiply by 10 and subtract the multiplicand.
To multiply by 11, multiply by 10 and add the multiplicand.
To multiply by 25, multiply by 100 and divide by 4.
To divide by 25, multiply by 4 and divide by 100.
To multiply by 125, multiply by 1000 and divide by 8.
To divide by 125, multiply by 8 and divide by 1000.

$$9 \times 643 = \begin{cases} 6430 \\ \underline{643} \\ \overline{5787} \end{cases} \quad 11 \times 643 = \begin{cases} 6430 \\ \underline{643} \\ \overline{7073} \end{cases} \quad \begin{matrix} 25 \times 36 = 3600 & + & 4 = 900 \\ 900 + & 25 = 36.00 & = 36 \end{matrix}$$

$$125 \times 32 = 32,000 + 8 = 4000 \qquad 4000 + 125 = 32.000 = 32$$

6. How much cheaper is it to buy a bushel of potatoes (60 lb.) for $1.59 than to buy at 5 lb. for 17 ¢?

Facts stated. Cost of potatoes by the bushel and in 5-pound lots.

Question. How much cheaper are they by the bushel?

Mental estimate. Cost of 60 lb. = 12 × cost of 5 lb. 12 × 17 ¢ = about $2. $2.00 − $1.60 = $.40.

Written work. 12 × $.17 = $2.04; $2.04 − $1.59 = $.45. This answer is near enough to the mental estimate, $.40, to be reasonable.

7. Find the cost of 80 T. coal @ $7.10 plus $19.95 freight.

Facts stated. Price per ton and quantity of coal; freight charges.

Question. What is the total cost?

Cost of coal = price of 1 ton multiplied by the number of tons. For total cost, add cost of freight.

Mental estimate. 80 T. = ⅘ of 100 T. 100 T. cost about $710.
⅘ of $710 = about $560; $560 + $20 = $580.

Written work. 80 T. = $\frac{4}{5}$ of 100 T.; $\frac{4}{\cancel{5}}$ of $\cancel{710}^{\,\$142}$ = $568; $568 + $19.95 = $587.95.

8. A gardener sells 4788 boxes of berries at an average price of 8⅓ ¢ a box; and 792 boxes at 12½ ¢ each. After deducting $150 for cultivation and labor, find his profit.

Facts stated. Price and quantity sold of each article; cost of raising.

Question. What is the profit?

Mental estimate. 8⅓ ¢ = $ $\frac{1}{12}$; $\frac{1}{12}$ of 4788 = about 400; 12½ ¢ = $ ⅛; ⅛ of 792 = about 100. $400 + $100 = $500; $500 − $150 = $350.

Written work. 4788 × $ $\frac{1}{12}$ = $399; 792 × $ ⅛ = $99; $399 + $99 = $498; $498 − $150 = $348.

In solving these problems, use short methods whenever possible.

9. A farmer raises 80 A. of oats that average 55¾ bu. per acre. What is the value of the crop at $.87½ a bushel?

10. When 1 pencil costs 12¢, how many can you buy for 60¢? for 96¢?

11. Cherries are 16¢ a pound. How many pounds can be bought for $1.44?

12. When 3 tons of coal cost $27, how much will 7 tons cost?

Why is it better in this example first to find the cost of 1 ton?

13. When 3 dozen lemons cost 90¢, how much do 9 doz. lemons cost?

Why is it better first to find the relation of 9 doz. to 3 doz.?

14. (*a*) If 3 men earn $30 in a certain time, how much will 8 men earn in the same time at the same rate?

(*b*) If 3 men earn $30 in a certain time, how much will 9 men earn in the same time at the same rate?

What is the most economical method of working (*a*)? of working (*b*)? Why?

15. When ½ a bushel of oats sells for 40¢, how much do 3 bushels cost?

SUGGESTION. 3 bu. = 6 × ½ bu.

16. How much is saved by buying a remnant of 7½ yd. of silk for $15 instead of buying 7½ yd. from the piece @ $2.50?

17. A 50-trip railroad ticket costs $16.70. What is the price per trip?

SUGGESTION. Since 50 = 100 ÷ 2, divide mentally by 100, and multiply the result, $.167, by 2.

18. How much is saved by buying a bag of potatoes containing 3 bu. for $4.20 instead of at 4¢ a pound?

19. How much is saved by paying $1200 cash for a car instead of paying for it in 12 installments of $125 each?

20. Which is cheaper, to buy 10 yd. of 18-inch wide silk at ·$1 a yard or 5 yd. of 36-inch wide silk at $1.75 a yard? How much cheaper?

21. Find the gain on 50 bu. of peaches bought at $1.50 a bushel and retailed at 50 ¢ a peck.

22. Frank worked 2½ hr. for five days each week, and 12 hr. each Saturday. Find his earnings for 10 wk. at 12 ¢ an hour.

23. If a boy paid $1.40 a hundred for papers, and sold them for 2 ¢ apiece, how much did he gain on 300 papers?

24. In an orchard there were 144 trees; 18 were cherry trees, 36 were apple trees, and ½ of the remainder were peach trees. How many were peach trees?

25. Find the cost of 24,000 railroad ties at 62½ ¢ each.

26. When lead pencils are sold at $1¾ per gross (144), find the cost of 3550 gross.

27. Find the cost of sewing buttons on 48 suits @ 3¾ ¢.

28. A contractor averaged 6⅞ rd. a day in digging a sewer. How long was the sewer if it took him 39 days to dig it?

29. A mail carrier traveled 23⅞ mi. for each delivery. How many miles did he travel in 310 deliveries?

30. An ocean steamer burned 201 5/16 T. of coal in a day. How much coal did it consume in a voyage of 7 days?

31. I bought 46 lb. of sugar @ 7 ¢, 95 lb. of coffee @ 23 ¢, and 36 doz. lemons @ 36 ¢. Find the cost of all.

32. Mr. Thomas raised 640 bu. of peaches, that were sold on an average at $1.50 a bushel basket. His baskets cost $35, and his labor $75. Find the price per bush⁴ he realized, after payment of baskets and labor.

33. An airplane covered 225 mi. in 1 hr. 45 min. Find its rate per minute.

34. Louise paid $4 down for a $50 Liberty bond and $2 a week until it was paid for. How many weekly install-ments of $2 did she pay?

35. At 34 ¢ each, how much do 189 books cost?

36. At 25 ¢ each, find the cost of 20 gross of pads.

37. If a school required an average of 497 pads of paper for 1 mo., how many pads were needed for 3 yr. of 10 mo. each?

38. Which is cheaper and how much, 3½ lb. of sugar for $.35 or 5 lb. for $.40?

39. How much do 96 qt. of cranberries cost, if 24 qt. cost $3.60?

40. A western farmer raised 6741 bu. of oats. He kept 349 bu. for feed and sold the remainder at $.70 a bushel. How much did he receive?

41. Philip had $2.80, which was ⅘ of what he needed for a War Savings Stamp. Find the price of the stamp.

PAID ADMISSIONS TO A FAIR

TICKETS	PRICE	TUES.	WED.	THURS.	FRI.	TOTAL RECEIPTS
42. Children	15 ¢	864	1865	1226	1285	
43. Adults	25 ¢	2864	3245	2764	3768	
44. One-horse vehicles	35 ¢	376	364	176	472	
45. Two-horse vehicles	50 ¢	212	216	144	224	

46 At 8 ¢ a pint, find the cost of 7 gal. 1 pt. of milk.

At 15 ¢ a quart, find the cost of 5 bu. 2 pk. of beans.

48. At 4 ¢ an ounce, find the cost of 10 lb. 3 oz. of ginger.

49. At 32 ¢ a pound, find the cost of 18 lb. of nut butter.

50. Mother is going to move. Which will be cheaper per year and how much, a heated apartment with rent at \$30 a month, or a non-heated apartment at \$26, if 8 tons of coal are needed at \$9 a ton?

51. Find the cost of sending a 15-word telegram at 75¢ for the first 10 words and 5¢ for each additional word.

52. How much will it cost to telegraph to the same place a night letter of 50 words, if the night rate for 50 words is the same as the day rate for 10 words?

53. A long distance telephone message costs \$1.25 for the first 3 min. and \$.40 for each additional minute. Find the cost of talking 17 min.

54. Which is cheaper, and how much per square foot, — a flag 3 ft. × 5 ft. for \$4.60 or a flag 4 ft. × 6 ft. for \$6.40?

55. By moving the clock forward 1 hr. from March 31 to Oct. 27 (210 days) 1,250,000 tons of coal were saved. What was the average number of tons saved per day?

56. 15,000 cu. ft. of gas give as much heat as a ton of coal. When coal is \$9 a ton and gas \$.80 a thousand cubic feet, how much does John's mother save by using 3 tons of coal instead of gas?

57. Edwin's father raises 120 lambs which average 78½ lb. The cost of keeping the lambs is \$200; they are sold at 12¢ a pound live weight. Find his profits.

58. Find the perimeter of a room 18 ft. by 15 ft.

59. A family income consists of \$40 a month earned by a son and \$45 earned by the mother. The expenses are \$16.50 for rent, \$38.09 for food, \$3.25 for light and fuel, \$14 for clothing, \$2.60 for car fares, and \$5 for sundries. How much can the family save each month?

Four H Clubs

The Four H Clubs (*Head, Heart, Hands, Health*) are organizations of boys and girls under the direction of the Department of Agriculture, for the raising of better corn, potatoes, tomatoes, pigs, poultry, etc., through proper instruction and training.

1. A corn-club boy tested three lots of seed corn. In lot 1, .75 of the kernels were good; in lot 2, .65 of the kernels; in lot 3, all were good. If the yield from seeds from lot 3 was 65 bu. per acre what would it be from lot 1? from lot 2?

2. In a year when the average yield of corn per acre was 28.2 bu., 3000 corn-club boys averaged 58 bu. to the acre. What would have been the increase in bushels on 106,000,000 acres of land if all the farmers had been as successful as these boys?

3. A corn-club boy in Alabama raised 233 bu. of corn on an acre at a cost of 19.9 ¢ a bushel. He sold the corn at 69.1 ¢ a bushel. What was his total profit?

4. One year the tomato-club girls of the South preserved 6,000,000 lb. of tomatoes at a profit of $200,000. What was the profit per pound?

5. A boy in Washington raised 871 bu. of potatoes on his acre, at a cost of $78.39. His profit was $313.56. Find the profit per bushel; the selling price per bushel.

6. A girl in Idaho belonging to a home canning club canned 532 qt. of vegetables at a cost of $31.95. Her profit was $101.05. Find the average selling price per quart.

7. Harold's flock of ten hens gave him 822 eggs at an expense of $5.59. He sold the eggs at $.40 a dozen. Find his profit.

Pig Clubs

1. Arthur was a member of a pig club. His pig gained an average of 2.4 lb. a day for 54 da. Find the total gain in weight.

2. Arthur's pig when bought weighed 73.4 lb. and cost $12. The cost of feeding was 10 ¢ for each pound gained. What was the total profit when the live pig sold at 15 ¢ a pound?

3. Frank's pig for 54 days gained 2.25 lb. a day. How much less was its total gain than that of Arthur's pig?

4. Frank's pig when bought weighed 60.5 lb. and cost $10. The cost of feeding the pig was 8 ¢ a pound for each pound gained. Find the total profit when the live pig sold at 15 ¢ a pound.

5. When Mary's pig was 10 wk. old it weighed 29 lb. When it was 11 mo. old it weighed 450 lb. Find to thousandths the average daily gain in weight for the 264 days.

6. Philip's pig weighed 40 lb. and cost $8. It gained 1.6 lb. a day for 95 da., at a cost of 7 ¢ for each pound gained. The live pig sold at 16 ¢ a pound. Find the profit.

7. Clara's pig gained 185 lb. If the cost of the feed was $9.25, what was its cost per pound of gain?

8. A pig-club boy and his father raised pigs from the same litter. The boy's pig, at an expense of $15.60, gained 520 lb. and was sold for $62.40. The father's pig, at an expense of $5.20, gained 65 lb. and was sold for $7.80. Find the expense of each pig for each pound gained. Find also how much greater the boy's profit was than the father's.

Time yourself in these exercises. Use short methods.
Count any part of a cent as an additional cent.

Find the cost of:

1. 14 yd. @ 7¢.
2. 40 lb. @ 7¢.
3. 53 qt. @ 8½¢.
4. 27 lb. @ 9¢.
5. 71 yd. @ 12¢.
6. 2 pt. @ 7½¢.
7. 6 lb. @ 10¢.
8. 2 qt. @ 6¾¢.
9. 26 qt. @ 8¢.
10. 12 bu. @ 84¢.
11. 3¾ yd. @ 8¢.
12. 2¾ yd. @ 10 ¢.
13. 4¾ lb. @ 12¢.
14. 2⅜ yd. @ 8¢.
15. 6¾ lb. @ 10¢.
16. 5⅔ yd. @ 5¢.
17. 4 pk. @ 9¢.
18. 9½ qt. @ 8¢.
19. 3¾ lb. @ 15¢.
20. 4¾ yd. @ 50¢.
21. 9¾ pt. @ 8½¢.
22. 41¾ lb. @ 12¢.
23. 22⅔ yd. @ 15¢.
24. 24¾ yd. @ 3¢.

25. 41¾ yd. @ 8¢.
26. 59¾ yd. @ 12¢.
27. 25 yd. @ 12¾¢.
28. 24¾ qt. @ 16¢.
29. 90¾ lb. @ 20¢.
30. 22⅔ yd. @ 48¢.
31. 12¼ qt. @ 20¢.
32. 56 pt. @ 8⅛¢.
33. 18 qt. @ 16⅔¢.
34. 60 yd. @ 12½¢.
35. 28¾ yd. @ 50¢.
36. 11 qt. @ 12¢.
37. 16⅔ yd. @ 18¢.
38. 36 yd. @ 12½¢.
39. 18 ft. @ 33⅓¢.
40. 12 bu. @ 75¢.
41. 14 lb. @ 8¢.
42. 102 lb. @ 12½¢.
43. 120 lb. @ 25¢.
44. 16¾ lb. @ 9¢.
45. 22¾ lb. @ 12½¢.
46. 83⅜ yd. @ 12¢.
47. 70¼ yd. @ 10½¢.
48. 56¾ yd. @ 6⅜¢.

Find how long it takes you to get the *right answers* to each set of five examples.

I

1. $\frac{3}{4}$ of 2 in.
2. $1.56 + 2.34 + 7.05$
3. $876.3 - 489.9$
4. $15 \times .16$
5. $25.25 \div 25$

II

1. $\frac{4}{5}$ of $\frac{5}{8}$
2. $25.009 + 3.5 + 18.056$
3. $42.54 - 21.306$
4. $9 \times .018$
5. $.375 \div 15$

III

1. $16 \times 5\frac{1}{4}$
2. $3.149 + .005 + .08$
3. $563.1 - 45.875$
4. $35 \times .369$
5. $4.878 \div 18$

IV

1. $\frac{2}{3}$ of $1\frac{1}{5}$
2. $29.02 + 9.006 + .087$
3. $45 - .059$
4. 178×3.7
5. $5.025 \div 3$

V

1. $\frac{3}{4} \times \frac{4}{5} \times \frac{2}{3}$
2. $93.56 + .935 + 9.356$
3. $2.25 - .075$
4. $.45 \times 228$
5. $9.106 \div 29$

VI

1. $\frac{1}{2}$ of $\frac{4}{5}$ of $\frac{5}{8}$
2. $10.4 + .056 + .908$
3. $38.5 - 7.625$
4. $.008 \times 614$
5. $.033 \div 3$

VII

1. $3\frac{3}{4} \times 6\frac{2}{3}$
2. $163.09 + .163 + 16.3$
3. $500 - 298.999$
4. $.038 \times 2095$
5. $12 \div 75$

VIII

1. $5\frac{5}{6} \times 7\frac{1}{5}$
2. $540 + .054 + 5.4$
3. $848.9 - 625.448$
4. 4.038×2500
5. $.5 \div 8$

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